LIPPINCOTT'S
PRACTICAL PRIMARY
ARITHMETIC

FIRST BOOK

·BHW·

LIPPINCOTT'S PRACTICAL PRIMARY ARITHMETIC

BEING THE DEVELOPMENT OF THE EARLY IDEAS OF NUMBER AND ITS PRACTICAL APPLICATION IN THE FIRST AND SECOND GRADES

FIRST BOOK

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BHW

PREFACE*

By retaining the best of the old and by combining
it with the progressive, the authors of this ARITHMETIC
aim to unify and correlate the work in the primary
grades, so that there will be no side-stepping or marking
time during this period.

The arrangement of the content is by grades from
the first to the fourth year inclusive. Each grade is
divided into half-year sections of five months. Ad-
vancement may be made from section to section, or
promotion from grade to grade at stated intervals,
or whenever the class has completed the prescribed
work.

The first-grade *unit* is presented as an outline or
manual for teachers. It consists of approved methods,
type lessons, concrete illustrations, and suggestions for
the early development of number concepts from 1 to
20. While the experienced and trained teacher may
have her own, and possibly more satisfactory methods,
yet for the sake of uniformity the general plan of devel-
opment in this book should be followed by all. For
the untrained and unskilled teacher the value of such

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* Written for First and Second Books.

lessons is incalculable. The greater part of the work in the first and second grades should be oral; children should be encouraged in the free use of materials for seat-work, as impressions may be made through the hand as well as through the eye or the ear.

The objective method in introducing new topics is continued throughout the grades. The concrete, however, is dropped as soon as the need for it ceases. The "45 combinations" and other tables are fixed by constant drill, until they become automatic. The idea of ratio begins naturally with the recognition of the relations of familiar objects to similar objects; and these relations, being comprehended by means of the senses, it is a short step to the fractional forms. The familiar terms of the tables of common measurement that come within the daily experience of the child are used from the beginning, but the Tables as a whole are not to be memorized until the fourth year.

Simple problems, adapted to the child's environment, are introduced early. They apply the abstract numbers already learned, and the answers are found by one operation. The oral precedes the written and is intended to stimulate interest, and also through frequent drills to produce quick thinking. Symbols are intro-

duced and explained as they are needed, but no defini-
tions are required in the first three grades.

The authors have attempted throughout the book to
give due consideration to the two aspects of arithmetic;
to give to each its proper proportion of emphasis, and
in so doing to relate one well to the other. The aim
has been first *the Why* and then *the How* of the processes;
to have the pupil connect what he learns with the vital
things of life, and then to acquire skill in what he does
by all the means at his command. We hope that the
book will prove helpful to many who strive for the
utility and the *culture* of Arithmetic.

THE AUTHORS.

CONTENTS

* The lessons of the first year constitute a manual for teachers.

PRACTICAL
PRIMARY ARITHMETIC

FIRST GRADE   **FIRST HALF YEAR**

LESSON I

Two and Combinations

1 1. Hold up one hand. How many hands are you
   now holding up?
2. Hold up your other hand.
3. Now, how many are you holding
   up?
4. Put down one hand. Now, how
   many hands are up?

```
 ●    ●
 two
  2
```

5. Put that hand down. Now, how many hands are
   up? (Starting with both hands down, raise one,
   then the other; lower one, then the other. Re-
   peat several times this action through 0, 1, 2, 1, 0.)
6. One hand and one hand are how many hands?
7. One and one are how many? How many ones
   in two?
8. Two hands less one hand are how many hands?
   Two less one are how many?
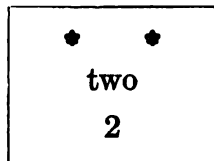
9. One hand less one hand are how many hands?
One less one are how many? (Use blocks in
similar exercises.)

naught	one	two	and	less	are
0	1	2	+	−	=

NOTE.—Teach these symbols now, and others as they occur.

10. Concrete illustration:

❧ and ❧ are ❧❧
1 and 1 are 2
1 + 1 = 2

$$\begin{array}{ccccccccccc}
0 & 1 & 1 & 0 & 2 & 1 & 2 & 2 & 1 & 1 & 2 \\
+2 & +1 & +0 & +1 & -1 & -1 & -? & -? & -? & -? & -? \\
\hline
2 & 2 & 1 & 1 & 1 & 0 & 0 & 1 & 0 & 1 & 0
\end{array}$$

11. Abstract expression:

0 and 1 are 1	2 less 1 are 1	1 less 1 are 0
0 + 1 = 1	2 − 1 = 1	1 − 1 = 0

NOTE.—A lesson is not intended as a day's assignment, but
is intended as the complete treatment of that particular topic.

12. Further application in directed seat-work, pupils
having material at their desks. For instance:

Lay out one peg or any other object.
Lay out another. How many?
Take away one. How many now? etc.

LESSON II

Three and Combinations

2   **1.** Hold up two fingers. Hold up one more
  finger.

  2. How many fingers are you holding up?

  3. Two fingers and one finger are how many
  fingers?

```
┌─────────┐
│ ✦ ✦ ✦  │
│ three   │
│   3     │
└─────────┘
```

  4. Three fingers are how many more than two fingers?

  5. Three fingers are how many times one finger?

  6. Lay down one finger. Now, how many fingers are
  you holding up?

  7. Three fingers less one finger are how many fingers?

  8. Hold up three fingers. Lay down two fingers.

  9. Now, how many fingers are you holding up?

  10. Three fingers less two fingers are how many fingers?

  11. Hold up three fingers. Lay down three fingers.
  Now, how many fingers are up?

  12. Three fingers less three fingers are how many fingers?

  13. Hold up one finger. How many more must you
  add to make three fingers?

  14. One finger and how many fingers make three fingers?

  15. Hold up two fingers. How many more must you
  add to make three fingers?

  16. Two fingers and how many fingers make three fingers?
  (Starting with all the fingers down, repeat the
  action through 0, 1, 2, 3, 2, 1, 0 several times.)
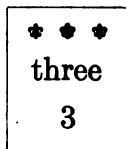
17. One finger and two fingers make how many fingers?

18. One and two are how many?　$1+2=?$　$2+1=?$

19. No fingers and how many fingers make three fingers?

20. Naught and three are how many?　$0+3=?$

21. Three fingers less one finger are how many fingers?

22. Three less one are how many?　$3-1=?$

23. Three fingers less two fingers are how many fingers?

24. Three less two are how many?　$3-2=?$

25. Three fingers are how many times one finger?

26. Three is how many times one?　3 is how many times 1?　(Use rulers, books, or other large objects in the hand of the teacher in a similar way.)　Then:

27. ●● and ● are ●●●　2 and 1 are 3　$\begin{cases} 1+2=3 \\ 2+1=3 \end{cases}$

28. ●●● less ●● are ●　3 less 2 are 1　$3-2=1$

29. ●●● less ● are ●●　3 less 1 are 2　$3-1=2$

30. 0 and ●●● are ●●●　0 and 3 are 3　$0+3=3$

31. ●●● less ●●● are 0　3 less 3 are 0　$3-3=0$

32.

```
  0   1   2   3   3   3   3   0   1   2   3   3   3   3   3
 +3  +2  +1  +0  -1  -2  -3  +?  +?   ?   ? -?   ?   ? -?
 ───────────────────────────────────────────────────────
  3   3   3   3   2   1   0   3   3   3   3   3   2   1   0
```

33.

```
  ?   ?   ?   ?   ?   ?   ?
 +3  +1  +2  +0  -3  -2  -1
 ──────────────────────────
  3   3   3   3   0   1   2
```

NOTE.—Further application in directed seat-work, pupils having material at their desks.

LESSON III

Review (1, 2, 3)

3 1. One orange and one orange are how many oranges?
2. Two boys are how many times one boy?
3. Two cents less one cent are how many cents?
4. Two rulers and one ruler are how many rulers?
5. Three marbles are how many times one marble?
6. Two apples are how many more than one apple?
7. Three girls are how many more than one girl?
8. Three pencils are how many more than two pencils?
9.
$$\begin{array}{ccccccccccc} 1 & 2 & 2 & 3 & 1 & 1 & 3 & 1 & 3 & 3 & 2 \\ +0 & -2 & +1 & -1 & +2 & -1 & -2 & +1 & +0 & -3 & +0 \\ \hline \end{array}$$

NOTE.—Make haste slowly—thoroughness.

LESSON IV

Four and Combinations

4 **1.** Hold up all the fingers on one hand.
Can you count them?

Say how many there are.
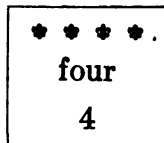
  2. Take one down. How many are left?

  3. Take another (and another and another
till all are down) and say how many are left.

  4. Raise one by one till all are up, and say how many
are up each time.

  5. Take down half of them. How many are left?

  6. Two fingers are what part of four fingers?

  7. Four fingers are how many times two fingers?

  8. Raise four fingers; take down three; how many are
left?

  9. Three fingers and one finger are how many fingers?

(Use balls, blocks, etc., over and over to get the

4, 3, 2, 1, 0, 1, 2, 3, 4; 0, 2, 4, 2, 0.)

  10. One and one and one and one are how many?

1 and 1 and 1 and 1   = how many?
1 + 1 + 1 + 1 = ?

  11. How many ones make four? Four times one are
how many?

  12. One time four are how many?

[box:]
* * * * .
four
4

13. Four times one are four.

$$4 \times 1 = 4 \qquad \text{times} \left\{ \begin{array}{l} \text{new word and} \\ \times \quad \text{symbol.} \end{array} \right.$$
$$1 \times 4 = 4$$

14. Two and two are how many? Four less two are how many?

15. One half of four are how many? $\left\{ \begin{array}{l} \text{Teacher explains} \\ \frac{1}{2}; \text{ new symbol.} \end{array} \right.$

16. Two times two are what? $2+2=?$ $4-2=?$
$2 \times 2 = ?$ $\frac{1}{2}$ of $4 = ?$

17.	**18.**
One and three $= ?$	Three and one $= ?$
$1 \ + \ 3 \ = ?$	$3 \ + \ 1 \ = ?$
19.	**20.**
Four less one $= ?$	Four less three $= ?$
$4 \ - \ 1 \ =$	$4 \ - \ 3 \ = ?$

$$
\begin{array}{lllllll}
1 & 2 & 3 & 1 & 4 & 4 & 4 & 2 \\
+1 & +2 & +1 & +3 & -1 & -3 & \times 1 & \times 2 \\
\hline
1 & — & — & — & — & — & — & — \\
1 & & & & & & & \\
\hline
\end{array}
$$

$\frac{1}{2}$ of $4 = ?$
$\frac{1}{2}$ of $2 = ?$

$$
\begin{array}{lll}
1 & 1 & 1 \\
+2 & +0 & +2 \\
\hline
1 & 1 & 0 \\
— & 2 & 1 \\
\hline
\end{array}
$$

21. / / / / = how many ?   ✢ ✢   ✢ ✢ =
// // =   ✢ ✢ ✢   ✢ =
/ /// =   ✢   ✢ ✢ ✢ =
/// / =   ✢   ✢ ✢   ✢ =
✢   ✢   ✢ ✢ =

5 Application: (1) Tom had 4 cents and spent 1 of them. How many were left?

(2) Harry had 2 marbles, and bought 2 more. How
    many has he now?

(3) Emma saw 1 blue-bird and 3 red-birds. How many
    did she see?

(4) Tom has 2 flags. Harry said, "I have twice as
    many." How many has Harry?

(5) I have two pieces of candy; you have two more
    than I. How many have you?

(6) The red hen has 1 egg; the white one has twice as
    many. How many have both?

(7) I had 4 cents, and spent 3. How many had I then?

(8) Add 2 apples, 1 apple, and 1 apple.

(9) A boy had 4 pennies; he spent half of them, and
    lost 2. How many were left?

(10) Tell 3 different ways to separate 4.
     Tell 3 different groups that make 4.

LESSON V
Review

6 1.

```
                                    1 1
  1  1 1    4  4 ·4  4    1  1  1  1 1    1  3  2  0
  ?  ? 3   -1 -2 -3 -4    2  3  1  1 1·   3  1  2  4
 ── ── ──  ── ── ── ──   ── ── ── ── ──  1  ── ── ── ──
  2  3                                   ──
```

2.
$1\times2=$ $2\times1=$ $\frac{1}{2}$ of $2=$ $2\times2=$

$1\times3=$ $3\times1=$ $\frac{1}{2}$ of $4=$ $2\times?=4$

$1\times4=$ $4\times1=$ $1\times?=4$

$1\times?=2$

$4\times?=4$

$2\times?=2$

NOTE.—When the combinations are well learned from lessons in which the teacher uses *large* objects before the class, let the pupils use pegs, sticks, lentils, or other *small* objects at desks or tables to illustrate these combinations.

LESSON VI

7   Quick exercise:

Show two ones
three ones
four ones
one three

Counting lesson.
Can you count?
Let me hear you count the
boys in one row. In two
rows.

NOTE.—Let each count as far
as he is correct, pointing to
objects, to accustom to the
name, and to associate with
some practical use.

one four
one half of two
one half of four
two times one
two times two
three and one
one and three

Then for seat-work he can
use the pegs, etc., to illus-
trate the numbers. Thus:

✿

✿ ✿

✿ ✿ ✿

✿ ✿ ✿ ✿ and so on.

LESSON VII
Five and Combinations

8 **1.** Hold up all the fingers on one hand and one on the other. How many? Five.

2. Now hold up the fingers on one hand. How many must you hold up on the other to make five?

> ♦ ♦ ♦
> ♦ ♦
> five
> 5

3. Four and one make how many?

4. Now hold up three fingers on one hand. How many must you hold up to make five? Three and how many make five?

5. Now hold up two fingers. How many more will make five?

6. Two and three make how many?

7. Now hold up one finger. How many more will make five?

8. One and how many make five?

9. Separate ●●●●● into ● and ? $5 = 1 +\,?$

10.   ●●●●● into ●●● and ? $5 = 3 +\,?$

11.   ●●●●● into ●● and ? $5 = 2 +\,?$

12.   ●●●●● into ? and ●●●● $5 = ? + 4\,?$

13.   ●●●●● into ● and ●● and ? $5 = 1 + 2 +\,?$

14.   ●●●●● into ● and ● and ? $5 = 1 + 1 +\,?$
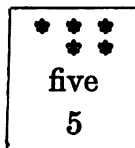
NOTE.—Teacher, having five blocks, lays them down one at a time. What is this? How many times have I laid down a block? (Each time for five times.) How many blocks have I laid down?

Five blocks are how many times one block?

Five is how many times one? $5 = ? \times 1$.

Five blocks are how many times five blocks?

Five is how many times five? $5 = ? \times 5$.

    Lay out five pegs.

Separate them into

groups of ..2 and ?	$2 + ? = 5$
1 and ?	$1 + ? = 5$
5 and ?	$5 + ? = 5$
1 and 2 and ?	$1 + 2 + ? = 5$
	$1 + 1 + ? = 5$
1 and 1 and ?	$1 + 1 + 1 + ? = 5$
1 and 1 and 1 and ?	$1 + 1 + 1 + 1 + 1 = 5$

Separate them into ones.

    Lay out five pegs.

Take away four. How many have you?	$5 - 4 =$
two.	$5 - 2 =$
five.	$5 - 5 =$
one.	$5 - 1 =$
three.	$5 - 3 =$

$11111 = 1111$ and $1 = 111$ and $11 = 1$ and 1 and 1 and 1 and $1 =$ Five 1's.

```
4 2 0 4 3     5 1   2   3   0   4      1 2 3 1 1 3 2
1 3 5 1 2     ? ? +   +   +   +        1 1 1 1 2 1 1
─ ─ ─ ─ ─     ─ ─   ─   ─   ─   ─      2 ? ? 1 1 1 2
              5 5   4   5   5   5      ? ─ ─ 1 1 ─ ─
                                      ─ 5 5 1 1
                                      5       ─


  5  5  5  5  5    5  5  5  5  5       5 1 5 1
 -1 -4 -2 -3 -5    ─  ─  ─  ─  ─      ×1×5×?× ?
  ─  ─  ─  ─  ─    4  3  2  1  0       ─   ─  ─
                                          5  5
```

9 Application: (1) Our ball team won 3 games and lost 2. How many did they play?

(2) There are 5 school days in a week. May staid home 1 day. How many days did she come?

(3) John gathered 5 eggs in the morning. His mother used 5 for breakfast. How many were left?

(4) Harry has 4 cents toward a 5-cent pencil. How many cents does he need?

(5) Mary bought 2 cents' worth of candy with a five-cent piece. How much change should she get?

(6) John started the game with 2 marbles. At the end he had 5. How many did he win?

(7) How many times must you draw one inch to have 5 inches?

(8) One pupil sits at a desk. How many desks do you need for five pupils?

(9) A boy gave his sister 4 apples, and had 1 left. How many had he at first?

(10) Five little birds sat up in a tree. Two flew away and there were ——?

LESSON VIII

Six and Combinations

10 1. Hold up four fingers on one hand and
two on the other.
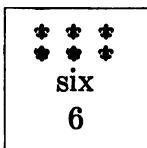
2. Count them as you put them down one
at a time.   How many?   How many
more than 5 are 6? $6 - 5 =$

six
6

3. Hold up four.   How many more do you
need to make 6? $4 + 2 =$

4. Hold up three.   How many more will
make 6? $3 + ? = 6$

5. ●●●●●● = ●●●● and ●● $6 = 4 + 2$
     = ●●●●● and ● $6 = 5 + 1$
     = ●●● and ●●● $6 = 3 + 3$
     = ●● and ●● and ●● $6 = 2 + 2 + 2$

6. Lay out six pegs.   Count them.
Lay them in four and ?   Lay them in one and ?
Lay them in three and ?   Lay them in groups of two.
How many 2's in 6? $6 = 3$ twos $= 3 \times 2$
Separate six into three groups just alike.   How
many in each group?

7. One-third of six pegs are how many pegs? $\frac{1}{3}$ of $6 = 2$
●●●●●● = ●● and ●● and ●●.
What part of 6 pegs is 2 pegs? $2 = \frac{1}{3}$ of 6.
What part of 6 is 2?

8. One-third of 6 cents is how many cents? $\frac{1}{3}$ of 6 =
9. One-third of 6 boys is how many boys?
10. Draw a line 6 inches long. Mark off 2 inches. What part of the line is that?

   Mark off another. How many thirds are left? How many thirds make the whole line?
11. Lay 6 blocks like this: ***
                               ***

   How many rows up and down? How many are there in each row?
12. 3 twos are how many? $3 \times 2 =$ $\frac{1}{3}$ of 6 =
13. Now count the rows across. How many in each row across?

   2 threes are how many? $2 \times 3 =$ $\frac{1}{2}$ of 6 =
14. Count to 6 by ones.   ●●●●●● $6 = 5 + 1$
            by twos.   ●● ●● ●● $= 4 + 2$
            by threes.   ●●● ●●● $= 3 + 3$
                                    $= 0 + 6$
                                    $= 3$ twos
                                    $= 2$ threes
                                    $= 6$ ones.

15.
$$\begin{array}{ccccccc} 5 & 0 & 2 & 3 & 6 & 1 & 4 \\ +1 & +6 & +4 & +3 & +0 & +5 & +2 \\ \hline \end{array}$$

17.

16.
$$\begin{array}{ccccccc} 5 & 6 & 4 & 3 & 0 & 1 & 2 \\ +? & +? & +? & +? & +? & +? & +? \\ \hline 6 & 6 & 6 & 6 & 6 & 6 & 6 \end{array}$$

$$\begin{array}{ccccccc} 6 & 6 & 6 & 6 & 6 & 6 & 6 \\ -? & -? & -? & -? & -? & -? & -? \\ \hline 5 & 3 & 6 & 2 & 1 & 4 & 0 \end{array}$$

18. $3\times?=6$ $\quad 2\times?=6$ $\quad 6\times?=6$ $\quad \frac{1}{3}$ of $6=$ $\quad \frac{1}{2}$ of $6=$

19.

Add 1 to each number.

Subtract 1 from each number.

20.

					1		
1	4	5	2	1	1	2	3
1	4	5	2	2	1	1	2
2	1	0	2	1	1	1	0
3	1	1	2	2	3	1	1
—	—	—	—	—	—	—	—

11 Application: (1) Six blocks stood in a pile. Two fell down. How many were left?

(2) John has 6 marbles. 3 are in one pocket. How many are in the other?

(3) John walked 5 blocks and ran 1 block from school to home. How far away did he live?

(4) The mother hen had 5 little chicks. How many were there altogether?

(5) Six trees are back of the house. One-third of them are apple trees. How many are apple trees?

(6) One-half of them are cherry trees. How many are cherry trees?

(7) Six eggs are in this nest, and 2 in that. How many more eggs are in this nest?

(8) I see 6 pigeons. 3 are white. How many are not white?

(9) Six girls are standing in groups of 2 and 2 and —?

(10) An orange costs 2 cents. How many can you buy for 6 cents?

(11) An apple costs 1 cent. How many can you buy for 6 cents?

(12) A grape fruit costs 3 cents. How many can you buy for 6 cents?

(13) How much would 1 orange, 1 apple, and 1 grape fruit cost?

LESSON IX

Seven and Combinations

12 1. Watch me as I raise my fingers one at a time, and count as I raise them (4 on one hand, 3 on the other).

How many did I raise?

Now, I will take them down one at a time, till all are down. Tell how many are left after each subtraction.

You raise 7 fingers. Hold one away from the others, —how many are left? Six fingers and one finger make how many? Take two away,—how many are left?

2. Five and two are how many?

3. How many fingers did you hold up at first on one hand? On the other?

4. Four fingers and three fingers make how many? (Repeat this over and over, reversing 1 and 6, 2 and 5, 3 and 4 to 6 and 1, 5 and 2, 4 and 3.)

5. Lay 7 pegs on your table. Take one away. How many are left?

6. Separate these in half. What is half of 6?

7. Three pegs and three pegs and one peg are how many?

8. Take one away, and separate the remaining ones into three equal parts.
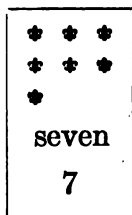
9. What is one-third of 6? Two and two and two and one are how many?

NOTE.—The idea of the authors is to employ a variety of illustrative devices to obviate monotony.

10. ✿ ✿ ✿ + ✿ ✿ ✿ ✿ = ?   0 0 0 0 0̸ 0̸ 0̸ = ?

   ✿ ✿ + ✿ ✿ ✿ ✿ ✿ = ?   0 0 0̸

   ✿ ✿ ✿ ✿ + ✿ ✿ ✿ = ?   0 0 0̸

   ✿ ✿ + ✿ ✿ ✿ + ✿ ✿ = ?   0 0̸

   ✿ ✿ ✿ and ✿ ✿ ✿ and ✿ = ?   0 0̸ 0̸ = ?

   ✿ ✿ and ✿ ✿ and ✿ ✿ and ✿ = ? 0 0̸.

   ⦂ and ∙ and ⦂ = how many?   0̸ 0̸ 0̸

                               0̸ 0̸ 0̸ = ?

   ⠶ ⠶ ⠶ and ∙ = ?   0

   $\left. \begin{array}{l} \\ \\ \\ \\ \\ \\ \\ \\ \\ \end{array} \right\}$ (In concrete illustration the stroke through the symbol indicates subtraction.)

11. ✿ and $\begin{smallmatrix} ✿ & ✿ & ✿ \\ ✿ & ✿ & ✿ \end{smallmatrix}$ = ? $\begin{smallmatrix} ✿ & ✿ & ✿ \\ & ✿ & ✿ \end{smallmatrix}$ and ✿ ✿ = ?

12. Lay out seven objects. Take one away. How many threes are left? How many twos are left?

Take two away. How many are left?

Take three away. How many are left? How many twos are left?

Take four away. How many are left? Take six away. How many are left?

Take five away. How many are left? How many twos?

Take two threes away. How many are left?

Take three twos away. How many are left?

13. 6 and 1 are ?   6+1 =   7−1 =   7−7 =
5 and 2 are ?   5+2 =   7−2 =   7−0 =
4 and 3 are ?   4+3 =   7−3 =
7 and 0 are ?   3+4 =   7−4 =
                               2+5 =   7−5 =
                               1+6 =   7−6 =

14.

```
 2  4  3  1  6  0  1  7  7  7  7  7  7  7
 5  3  4  6  1  7  6 -0 -3 -2 -5 -6 -1 -7
__ __ __ __ __ __ __ __ __ __ __ __ __ __
```

15.

```
 1   1   2   1   1   4   5   1   1
 2   1   1   1   1   1   1   1   0
 3   2   2   1   1   1   1   1   2
 1   2   1   1   2   1   —   2   0
 —   1   1   1   2   —       1   4
 —   —   1   —       1   —
 1
__
```

13 Application: (1) May is 5 years old; Anna is 2 years older.   How old is Anna?

(2) My top cost 3 cents; Tom's cost 4 cents more.   How much did Tom's cost?

(3) I had 7 pennies and lost 5.   How many were left?

(4) I had 4 marbles; Will had 3 more; how many had he?

(5) Emma found half a dozen eggs in one nest, and broke 2.   How many were left?

(6) Half a dozen and how many more make 7?

(7) 5 blue flowers and 2 white flowers are how many?

(8) Tom threw the ball to goal 7 times, and Harry 3 less.   How many times did Harry reach it?

(9) Tell the different ways you can make 7.

(10) Tell how many times you can take 2 away from 7. Three away from 7.

14 Seat-work: Cut a strip of paper 7 inches long and one inch wide. Mark off the inches with your crayon against the ruler. Cut off each inch. (Squares.) How many figures did you get? What shape is each? How long is each side of the square? How far around each? With pegs or sticks make all the combinations of 7 learned.

NOTE.—All seat-work should be directed by the teacher.

LESSON X

Days of the Week

15 1. Who knows the days of the week in order? Say
them.

Count them while I say them. How many days in
one week?

Begin with Sunday as first day. What is the last
day? The fifth, the third, the sixth?

What number is Monday? Thursday? Tuesday?
Friday?

How many school days are there? Which days are
school days?

If you miss two days in a week, how many days do
you go to school?

16 Seat-work: Count out 21 pegs. Call each one a day.
Separate into weeks. How many weeks have you?
Take away a Sunday and a Saturday from each
week. How many school days are left?

LESSON XI

17 Quick exercise.

Show 7 fingers

2 threes;	3 twos.
4 +3	2 +5
2 twos	2 fours
6 +1	½ of 6
½ of 4	½ of 2
3 ones	5 +2
	3 +4

Seat-work (Counting lesson):

Count out 20 sticks.
Separate into 2's. How many 2's? Separate into 10's. How many 10's?
Form squares with the sticks, one stick on a side. How many squares?
Form squares with 2 sticks on a side. How many squares?
How many sticks to make the small square? How many to make the big square?

Review

18
Add 2 to 1	3 to 3	4 to 3	5 to 0	6 to 0.
2	4	2	1	
3	2	1	2	
4	0	0		
5	1			
0				

Take 1 from 7, 6, 5, 4, 3, 2, 1   What are 2×1 3×2

    2 from 7, 6, 5, 4, 3, 2 3×1 5×1

    3 from 7, 6, 5, 4, 3 2×2 1×5

    4 from 7, 6, 5, 4 $\frac{1}{2}$ of 2 = 2×3

    5 from 7, 6, 5 $\frac{1}{2}$ of 4 =

    6 from 7, 6 $\frac{1}{2}$ of 6 =

Group in as many ways as we have learned: 7, 6, 5, 4, 3, 2.

Take away in as many ways as we have learned from 1, 2, 3, 4, 5, 6, 7.

LESSON XII
Eight and Combinations

19 1. I am holding up all my fingers now. How many on each hand?

2. Count them as I put them down one at a time. How many?

3. Now count them as I put them up one at a time.

eight
8

4. How many ones make eight? $8 \times 1 = 8$.

5. Use your own fingers now. How many 2's make 8? $4 \times 2 = 8$.

6. How many 4's make 8? $2 \times 4 = 8$.

7. Hold one finger away from the others. How many are left? Seven fingers and 1 finger make 8 fingers.

8. Hold two away—and how many remain?

9. Six fingers and two fingers are how many? (And so on, holding away, and then making the sums of all possible groups; also getting remainder after each subtraction.) Repeat with blocks, and with diagrams or drawings at the board, giving much practice in all the combinations of 8 concretely.

Give each pupil 8 sticks or pegs or blocks.

Let him arrange them 1 and 7, 2 and 6, 3 and 5, etc., giving him the first number, and letting him find the second, and from his finding make the abstract sums at the board for his study:

10.
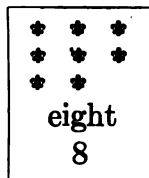
1	2	3	4	5	6	7	8	8	8	8	8	8	8	8
7	6	5	4	3	2	1	−1	−2	−3	−4	−5	−6	−7	−8
8	8	8	8	8	8	8	7	6	5	4	3	2	1	0

11. Separate 8 into ones. How many? $1+1+1+1+$
$1+1+1+1=8$. $8\times1=$

Separate 8 into twos. How many? $2+2+2+2=8$.
$4\times2=$

Separate 8 into fours. How many? $4+4=8$.
$2\times4=$

12.

2	3	2	4	1	5	6	2	8	8	8	8	$\frac{1}{2}$ of 8 =
1	3	3	4	2	1	2	6	−4	−?	−1	−?	$1\times2\times4=$
4	1	2	−	3	2	−	−	−	3	−	6	$2\times2\times2=$
1	1	1		2	−							$4\times1\times2=$

13. $000+00000=?$ $\qquad 4\times?=8$

$\qquad 0+0000000=?$ $\quad 2\times?=8$

$0000+0000=?$ $\qquad 8\times?=8$ $\qquad\because\ +?=8$

$\left.\begin{array}{l}00+000\\+\,000\end{array}\right\}=?$ $\qquad 0000\quad \cancel{0}\cancel{0}\cancel{0}\cancel{0}=?$ $\quad \clubsuit\,\clubsuit\,\clubsuit$

$\qquad\qquad\qquad\quad 0000\quad 000\cancel{0}=?$ $\clubsuit\,\clubsuit+\clubsuit\,\clubsuit\,\clubsuit=$

$\qquad\qquad 000\ \cancel{0}\cancel{0}\cancel{0}\ \cancel{0}\cancel{0}=?$ $\quad \therefore\ \therefore\ \therefore+\cdot\cdot=$

$\qquad\qquad 000\ 000\ \cancel{0}\cancel{0}=?$ $\quad \therefore\ \therefore\ +?=8$

20 Application: (1) I need 8 cents and I have only 5.
How many must I earn?

(2) Tom had 8 candies, and gave half to me. How
many had he left?

(3) I staid at your house one day more than a week.
How long was I there?

(4) I bought a pint of milk for 4 cents and a yeast cake for 2 cents. What did they cost?

(5) How much change will I have from 8 cents?

(6) Tom has 3 marbles. Dick has 5 more. How many has Dick?

(7) Separate 8 in as many different ways as we have learned.

(8) Take as many different amounts from 8 as you can. Say how many are left.

(9) Separate 8 into groups of the same number. How many different ways can you do this?

(10) Take first 2 from 8, then 3 from the remainder. How many now are left?

21   **Review**

1	3	1	1	6	7	8	$\frac{1}{2}$ of 2 =	1+2+2+2 =
1	4	2	2	−2	−3	−4	$\frac{1}{2}$ of 8 =	1+3+3 =
2	1	1	3	—	—	—	$\frac{1}{2}$ of 4 =	
—	0	4	—					

$$3+\begin{array}{|c} 4 \\ 0 \\ 2 \\ 3 \\ 1 \\ 5 \end{array} = ?$$

$$3 \text{ from } \begin{array}{|c} 8 \\ 4 \\ 3 \\ 6 \\ 7 \\ 5 \end{array} = ?$$

$$4 \text{ and } \begin{array}{|c} 4 \\ 1 \\ 0 \\ 3 \\ 2 \\ 1 \end{array} = ?$$

$$2 \text{ from } \begin{array}{|c} 8 \\ 2 \\ 3 \\ 6 \\ 7 \\ 5 \end{array} = ?$$

$$\left.\begin{array}{l} 2+2+2+2 \\ 2+2+2 \\ 2+2 \\ 2 \end{array}\right| = ?$$

1	3	8	7	6	8 −4	6 −4	3 ×2	
2	2 −1 −2 −4				8 −6	6 −1	3 ×1	
2	2 — — —				8 −3 = ··	6 +2 =	2 ×4	
2 —					7 −4	6 +1	2 ×2	
—					7 −5	6 −5	4 ×1 =	
					7 −3	6 +1	2 ×3	
							3 ×2	
							4 ×1	
							5 ×1	

22   Seat-work: Lay 2 pegs in first row; two more in each successive row. Now count how many in each row. How many in the tenth row?

With 8 inch-blocks: Lay 2 in a row; make two rows. How many layers like this can you make? What will it form? How many square inches on each face?

Cut a strip of paper 8 inches long, 2 wide. Mark off the inches with the ruler. How many square inches in each row? Count how many in both rows.

Make another strip 8 inches long and 2 wide. Mark off the inches. Count how many inches all the way around the strip.

Lay out 20 pegs. How many 5's can you get? How many 4's? How many 8's? Separate by counting into 3's, 6's, 7's, 8's, and see how many are left each time.

LESSON XIII

Measuring Liquids

23 **1.** May's mother told me May drinks a pint of milk a day; and Tom a quart. Who drinks the more? Yes—a quart is more than a pint. With these cups see how

many small ones will fill the largest.   Two.
The small one is a pint measure.
The large one is a quart measure.   Quart   pint
                                    qt.   pt.

2. How many pints make a quart?

> 2 pints make 1 quart.
> 1   qt.   = 2 pts.
> 1 pint   = $\frac{1}{2}$ of a quart.

3. What part of a quart is a pint?
Here is a very small measure.   Gill.
   See how many times you   4 gills = 1 pint
   must use it to fill the pint cup.   8 gills = 1 quart.

4. How many times must you use the gill cup to fill the quart cup?
Such measures are used for liquids, and this is
   called *Liquid measure:* 4 gills = 1 pint.
                             2 pints = 1 quart.

5. How many times as much milk as May drank a day did Tom drink?
6. May's milk was what part of Tom's milk?
7. How many pints does May drink in 8 days? How many quarts will' that be?
8. How many gills does May drink in a day? in 2 days? How many quarts in 2 days? in 4 days? in 6 days?

LESSON XIV

Nine and Combinations

24 1. Hold up all your fingers. How many on
each hand?
  2. How many on both hands?
  3. Hold up one thumb. Now how many
on that hand?
  4. How many on the other? How many on
both?

nine

9

  5. Five and four are how many? $5+4=9$
Now count as I raise mine, one at a time. How
many?
  6. How many ones make nine? $9\times1=9$
  7. Now raise yours one at a time and count 1 to 9.
  8. Put down your thumb. How many times four
fingers are left? $9=1+4+4$
  9. How many times two fingers are left? $9=1+2+2+2+2$
  10. How many fingers are left? $9-1=8$
  11. Put up the thumb. Now, how many? $8+1=9$
  12. Put down the thumb and one finger. How many
have you put down? How many are left? $9-2=7$
  13. Seven and two make how many? $7+2=9$
  14. Put down one more finger. How many are left?
$9-3=6$
  15. Nine is six and how many more? $9=6+3$
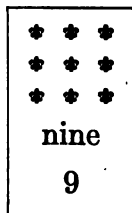
16. (And so on until nine are down, making the sums equal nine, and the remainders decrease to naught.)

17. Repeat with blocks and with drawings on the board, giving practice in building up nine and separating it into its parts.

18. Lay nine pegs in a row on your desk. Count them.

19. Separate them into 3 groups just alike. How many in each group? How many threes in 9? $3 \times 3 = 9$

25 1. Count by 3's to 9.

Lay one apart from the rest.   Lay the rest in twos. How many twos?   Beginning with 1, count by 2's. 1, 3, 5, 7, 9.

Lay 2 twos together.   How many fours have you? Beginning with 1, count by 4's.   1, 5, 9

Lay them in 3's.   How many groups? How many in one-third of 9? $\frac{1}{3}$ of $9 = 3$

2. Arrange them in 1 and 8, 2 and 7, 3 and 6, and so on; and I'll make the sums on the board for you.

```
  1  2  3  4  5  6  7  8  9
 +8 +7 +6 +5 +4 +3 +2 +1 +0
 ── ── ── ── ── ── ── ── ──
  9  9  9  9  9  9  9  9  9
```

3. Lay the 9 together.   Now take away 1, 2, 3, 4, etc., and I'll write on the board what is left.

```
  9  9  9  9  9  9  9  9  9
 -1 -2 -3 -4 -5 -6 -7 -8 -9
 ── ── ── ── ── ── ── ── ──
  8  7  6  5  4  3  2  1  0
```

4. Separate 9 into ones. How many? $9 \times 1 = 9$
              into threes. How many? $3 \times 3 = 9$

5.
3	6	2	2	2	1	1	3	6	3
3	3	4	5	3	4	2	3	2	3
3	—	3	2	2	4	2	1	1	2
—		—	—	2	—	2	1	—	1
				—		2	1		—
						—	—		

6.
7	5	3	4	2	6	1	8
?	?	?	?	?	?	?	?
9	9	9	9	9	9	9	9

7.
2	3	4	5	6	7	1	8
2	3	3	2	2	1	4	1
?	?	?	?	?	?	?	?
9	9	9	9	9	9	9	9

8.
9	9	9	9	9	9	9	9	9
−8	−2	?	?	−7	−3	−0	−9	?
		6	5					8

9. $\frac{1}{3}$ of $9 = ?$ $0\,0\,0\,0 + 0\,0\,0\,0\,0 =$

     $3 \times ? = 9$ $0\,0\,0 + 0\,0\,0 + 0\,0\,0 =$

                ✱✱✱ ✱✱✱ $+ ?$ $=$✱✱✱ ✱✱✱ ✱✱✱

✱✱
✱✱   ✱✱✱✱   ✱✱✱
✱✱ and ✱ = ✱✱✱✱ and ✱ = ✱✱✱ =
✱✱   ✱✱✱✱   ✱✱✱
✱✱

$0\,0\,0\,0$ $\emptyset\,\emptyset\,\emptyset\,\emptyset$ $0 =$ $0\,0\,0$ $0\,0\,0$ $\emptyset\,\emptyset =$

$\emptyset\,\emptyset\,\emptyset\,\emptyset\,\emptyset$ $0\,0\,0\,0 =$ $0\,0$ $\emptyset\,\emptyset$ $\emptyset\,\emptyset$ $\emptyset\,\emptyset$ $0 =$

3—Pt. I

Problems

(1) John started the game with 9 marbles. He lost 5. How many had he at the end of the game?

(2) Mary had 9 cents for carfares. She paid one-third of them each day. How many cents did she pay? How many days did 9 cents last?

(3) The boys gathered 9 quarts of nuts. They sold 7 quarts. How many quarts did they keep?

(4) Nine apples fell to the ground. Only 3 were good. How many were bad?

(5) A newsboy sold 9 papers at 1 cent each. How many cents did he receive?

(6) Mary bought 3 oranges at 3 cents apiece. How many cents did she need to pay for them?

(7) Mary staid in the country 4 days. Her brother staid 5 days longer. How many days did her brother stay?

(8) How many days more than a week did he stay?

(9) John's mother gave him 9 cents to pay their carfare. The fare was ·5 cents for the mother and 3 cents for John. How many cents had he over?

(10) Nine pear trees stood 3 in a row. How many rows were there?

Review

Add

26 1. 2 1 2 1·
        4 3 0 2
        3 5 7 3
        ⎯ ⎯ ⎯ ⎯

Subtract

2. 9 8 7 9
   −9 −6 −4 −3
    ⎯ ⎯ ⎯ ⎯

3. Begin with 0, and count by 2's to 8

by 3's to 9

4. Begin with 1, and count by 3's to 7

by 4's to 9

5.

$\frac{1}{3}$ of 3

$\frac{1}{3}$ of 6

$\frac{1}{3}$ of 9

6.

$4+4+1 =$

$3+3+3 =$

$3+3 \quad =$

$9+0 \quad =$

7.

9
8
7
6
5 $-1=?$
4
3
2
1

8.

9
8
7
6
5 $-2=?$
4
3
2

9.

9
8
7
6 $-3=?$
5
4
3

10.

5
4
3 $+4=?$
2
1

11.

4
3
2 $+5=?$
1

12.

3
2 $+6=?$
1

13.

$6+3-2 =$

$5+2-4 =$

$8-5+3 =$

$9-2+1 =$

27 Seat-work: Count out 9 sticks. Lay them by ones. How many ones?

Lay them in twos. How many twos? How many left over?

Lay them in threes. How many threes? How many left over?

Lay them in fours. How many fours? How many left over?

Lay them in fives. How many fives? How many left over?

Lay them this way: ☐ Can you lay out another square?

How many left?

Lay them this way: △ How many times can you lay them this way?

Pick up your square piece of paper like mine. Measure with your inch ruler each edge. How many inches?

Mark off the inches. Fold your paper on the marks. Watch me fold mine. Now lay it flat.

Count the little squares. Count how many rows. Count how many in each row. $3 \times 3 = 9$

Write the nine figures in the little squares, this way:

1	2	3
4	5	6
7	8	9

On the other side write them this way:

1	4	7
2	5	8
3	6	9

```
    1  2   3  4   5  6   7  8 | 9
1|  2  3   4  5   6  7 | 8  9
2|  3  4   5  6 | 7  8   9
3|  4  5 | 6  7   8  9
4|  5  6   7  8   9
5|  6  7   8  9
6|  7  8   9
7|  8  9
8|  9
9|
```

FIRST GRADE   **SECOND HALF YEAR**

LESSON XV
Ten and Combinations

28 **1.** Watch me hold up my fingers and
thumbs one at a time; and count as
I raise them.   Now count again as
I lower them one at a time.   How
many ones are there?   Then ten
ones make 10.

ten
10
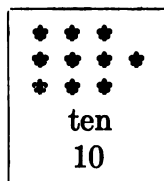
2. Raise your fingers and thumbs.   Say again how
many there are.

Hold one hand away from the other.   How many
on each?

Five and five make how many?

Five is what part of ten?

How many fives in ten?

Take down one finger.   How many are left? $9 + 1 = 10$.

Take down two fingers.   How many are left?
$8 + 2 = 10$.

NOTE.—In like manner proceed until all the combinations
have been studied.   Repeat many times until they have been
learned, and, as in all of the other lessons, they have become more
or less automatic.

3. With other articles, as pegs, blocks, sticks, etc.,
   separate ten into parts, then combine the parts
   into ten again,—giving the following on the board
   in abstract form:

$$\begin{array}{l}9+1\\8+2\\7+3\\6+4\\5+5\end{array}\bigg|=10 \qquad \begin{array}{l}4+6\\3+7\\2+8\\1+9\end{array}\bigg|=10 \qquad 10-\begin{array}{l}1=9\\2=8\\3=7\\4=6\\5=5\end{array} \qquad 10-\begin{array}{l}6=4\\7=3\\8=2\\9=1\end{array}$$

Separate 10 into 2's. How many? $5\times2=$

Separate 10 into 5's. How many? $2\times5=$

Separate 10 into 3's. How many? Three 3's and 1 more.

Separate 10 into 4's. How many? Two 4's and 2 more.

4. □□□□□□□□□ and □ = □□ □□ □□ □□ □□ =

   □□□□ □□□□ and □□ = □□□ □□□ □□□ □ =

   □□□ □□□□ and □□□ = □□□□ □□□□ □□ =

   □ □□□□□ and □□□□ = □□□□□ □□□□□ =

   □□□□□ and □□□□□ = □□□□□□□□□□ =

5. Begin at 1 and add 2's up to 9.
6. Begin at 2 and add 2's up to 10.

$1+2+2+2+2=$	$1+4+4=$	$4+4+1=$
$2+2+2+2+2=$	$1+5+4=$	$5+4+1=$
$1+3+3+3=$	$1+6+3=$	$6+3+1=$
	$1+7+2=$	$7+2+1=$

7. Add

1	2	6	0	4	3	2	9	5	1	4
+2	+3	+2	+7	+4	+3	+2	+0	+2	+0	+1
3	4	1	2	1	3	2	1	3	2	1
4	1	1	1	0	1	2	—	—	4	1
—	—	—	—	1	—	2			3	2

8.

10	10	10	10	10	10	10	
− 1	− 3	− 5	− 7	− 6	− 8	− 2	½ of 10 =

9. Add 2 to 1 | 3 to 1 | 4 to 1 | 5 to 1
4 | 4 | 3 | 5
6 | 7 | 5 | 0
8 | 6 | 2 | 4
3 | 5 | 4 | 3
2 | 3 | 6 | 2
7 | 2 | |

10. Take 2| from 10; from 9.   **11.** From 7 take 2|
3 | 4
7 | 3
1 | 1
6 | 0
8 | 6
9 | 7

12. What is ½ of 10| **13.** 2×2|
4 | 2×4
6| ?   2×5| =
2 | 2×1
8 | 2×3

29 Application: (1) Jack is 6 years old now; how long before he will be 10?

(2) After Tom paid his carfare, how much change did he have from a ten-cent piece?

(3) Suppose he pays his sister's fare too, what change will he have?

(4) Tom bought 5 marbles for a cent; how many could he have bought with 2 cents?

(5) 10 birds flew by this morning; 4 of them were crows. How many others were there?

(6) There were 4 eggs in the brown hen's nest, and 3 in the white hen's. How many in both?

(7) How many more must I find to have 10 eggs?

(8) A pint of milk costs 4 cents. How much will a quart cost? What change will I have from a dime?

(9) Separate 10 in all the ways you have learned.

(10) Take as many different amounts from 10 as you can.

30 Seat-work: Cut a strip of paper 10 inches long, 1 inch wide. Cut into squares. How many? Count how many inches around the strip.

Cut a strip 10 inches long, 2 inches wide. Mark off into squares, then cut. How many squares?

How many inches around each square?

Use pegs or sticks to illustrate all of the combinations of 10, 9, 8, etc.

LESSON XVI

On Tens

31 1. Did you notice that 10 is written with two figures? That is because every time we get *ten ones,* we call it *one* group of ten, and when we write it, we put the *one* in a place of its own—the second place to the left.

$$\boxed{\begin{matrix}*\,* \\ *\,* \\ *\,* \\ *\,* \\ *\,*\end{matrix}} + * = \text{eleven, } 11 \quad \boxed{\begin{matrix}*\,* \\ *\,* \\ *\,* \\ *\,* \\ *\,*\end{matrix}} + *\,* = \text{twelve, } 12 \quad \begin{matrix}\text{and} \\ \text{so} \\ \text{on} \\ \text{till}\end{matrix} \boxed{\begin{matrix}*\,* \\ *\,* \\ *\,* \\ *\,* \\ *\,*\end{matrix}} + \boxed{\begin{matrix}*\,* \\ *\,* \\ *\,* \\ *\,* \\ *\,*\end{matrix}} = 20$$

2. Two tens we call twenty; three tens, thirty; four tens, forty; five tens, fifty. The parts of tens are twenty-one, twenty-two, etc.; thirty-one, thirty-two, etc.; forty-one, forty-two, etc.

3. So when adding we keep on till we get a ten, which we place in the second column, and go on adding to what is left over in the ones column.

4. One ten and one ten are two tens, called twenty. $10 + 10 = 20$.

5. Twenty and ten are three tens, called thirty. $20 + 10 = 30$.

6. Thirty and ten are four tens, called forty. $30 + 10 = 40$.

7. Forty and ten are five tens, called fifty. $40 + 10 = 50$.

8. Count by ones to fifty. Count by tens to fifty.

9. Seat-work: Count out 10 sticks and tie them into a bundle. Tie up 5 such bundles. How many sticks have you? 5 tens or 50.

Count these the quick way—10, 20, 30, etc.

Count out 9 more sticks, and represent all of the numbers to 59.

LESSON XVII

Twenty

32 1. How many tens? Two tens are called twenty (20).

2. How many ones in 20? Count them.

3. How many 2's? Count by 2's to 20.

4. How many 4's? Count by 4's to 20.

5. How many 5's? Count by 5's. How many 10's? Count by 10's.

6. How many 10's in 20? 10 is what part of 20? 10 times 2 = 20. $\frac{1}{2}$ of 20 =

7. How many 5's in 20? 5 is what part of 20? 5 times 4 = 20. $\frac{1}{4}$ of 20 =

* = 21
* * = 22
and * * * = 23
* * * * = 24
* * * * * = 25
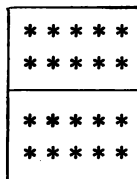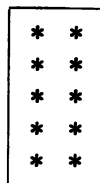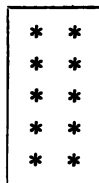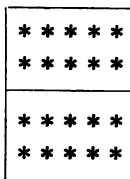
* * * * *
* = 26
and * * * * *
* * = 27

* * * * *
* * * = 28

* * * * *
* * * * = 29

8. Write the numbers from 0 to 9. Read them.

10 to 19. Read them.

20 to 29. Read them.

Count from 1 to 29.

9. $\begin{array}{c}20\\ +\,1\end{array}$ $\begin{array}{c}20\\ +\,2\end{array}$ $\begin{array}{c}20\\ +\,3\end{array}$ $\begin{array}{c}20\\ +\,4\end{array}$ $\begin{array}{c}20\\ +\,5\end{array}$ $\begin{array}{c}20\\ +\,6\end{array}$ $\begin{array}{c}20\\ +\,7\end{array}$ $\begin{array}{c}20\\ +\,8\end{array}$ $\begin{array}{c}20\\ +\,9\end{array}$

10.

11. 2 tens =   4 fives =   5 fours =
     2×10 = 4×5 = 5×4 =

$= \dfrac{20\ \text{ones}}{20 \times 1}\left(\begin{array}{c}\text{count}\\ \text{them}\end{array}\right)$

10 twos
10×2

LESSON XVIII

Eleven and Combinations

33 I. One ten and one are called eleven—11.

As I make eleven marks, count 11. (✸✸✸✸✸✸✸✸✸✸✸).

Count them by 2's.

✸✸ ✸✸ ✸✸ ✸✸ ✸✸ ✸

11 = 5 twos and 1.

How many 2's?   How many left?

Count them by 3's.

✸✸✸ ✸✸✸ ✸✸✸ ✸✸   11

How many 3's?   How many left?

= 3 threes and 2
= 2 fours and 3
= 2 fives and 1

(And so on through fives.)

Take away one from eleven.   How many are left?

2. How is 11 made up?   Then 11 = 10 + 1, 10 = 11 − 1, 1 = 11 − 10.

Now take away 2.   How many are left?

0 0 0 0 0 0 0 0 0 0̸ 0̸.

Now, how is 11 made up?   Then 11 = 9 + 2, 9 = 11 − 2, 2 = 11 − 9.

(And so on, getting the 8 and 3, 7 and 4, and 6 and 5 combinations.)

NOTE.—Have further board practice, using lines, drawings, etc., to continue the development.

For rapidity in counting and in separating into groups, let the pupils handle pegs, sticks, lentils, etc., at desks.
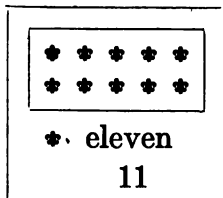
3. Lay out 11.   Count them.   How many ones?
11 ones = 11. $11 \times 1 = 11$.

4. Lay them in 2's; in 3's; in 4's; in 5's.

5.

11	10	9	8	7	6	5	4	3	2	1	0
+ 0	+ 1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11

6.

11	11	11	11	11	11	11	11
− 1	− 2	− 3	− 4	− 5	− 6	− 7	−. 8

7.

11	11	11
− 9	−10	−11

11	9	11	11	?	10	5	7
+ ?	+ ?	− ?	− ?	+ 3	+ ?	+ ?	+ ?
11	11	7	6	11	11	11	11

8. $11 - 6 + 5 =$? $7 + 4 - 2 =$? $11 - 4 + 1 =$?
$8 + 3 - 4 =$? $9 + 2 - 3 =$? $11 + 0 - 8 =$?

9. 11 = 1 and how many 2's?
11 = 1 and how many 5's?

10. 11 = 2 and how many 3's?
11 = 3 and how many 4's?

34 Application: (1) John had 11 cents.   If he spent 1 cent
each day, how many days did they last?

(2) Mary is 11 years old.   Her brother is 5 years
younger.   How old is her brother?

(3) William picked 8 quarts of nuts.   John picked 3
quarts.   How many did both pick?

(4) The milkman has 11 pints of milk. How many times can he fill the quart measure? How many pints will be left?

(5) Harry has 7 marbles in one pocket and 4 in the other. How many marbles has he?

(6) A newsboy had 11 papers. He sold all but 2. How many did he sell?

(7) 11 boys want to play baseball. We need only 9 for the team. How many can not play?

(8) 11 days are how many days more than a week?

(9) The sun rises at 6 o'clock. It is now 11 o'clock. How many hours is it since sunrise?

(10) A pint of milk costs 4 cents. How many pints can I buy out of 11 cents? How many cents will be left?

Review

35

1. $\frac{1}{2}$ of 4
   $\frac{1}{2}$ of 6
   $\frac{1}{2}$ of 8
   $\frac{1}{2}$ of 10

2. $\frac{1}{3}$ of 6
   $\frac{1}{3}$ of 9
   2×2
   2×3
   2×4
   2×5
   3×3

3.

2	1	2	3	4	5	8	6	7	9
+4	+5	+3	+0	+1	+2	+1	+2	+1	+1
5	5	4	3	4	3	2	2	2	1

4. Begin with 1. $\begin{cases} \text{Count by 2's to 11.} \\ \text{Count by 5's to 11.} \end{cases}$ 5. $6 = 3 \times \text{ ?}$

Begin with 2.   Count by 3's to 11. $9 = 3 \times \text{ ?}$

Begin with 3.   Count by 4's to 11. $8 = 2 \times \text{ ?}$

$10 = 2 \times \text{ ?}$

6. 1 and $\begin{vmatrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \end{vmatrix}$ 7. 2 and $\begin{vmatrix} 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \end{vmatrix}$ 8. 3 and $\begin{vmatrix} 3 \\ 4 \\ 5 \\ 6 \end{vmatrix}$ 9. 4 and $\begin{vmatrix} 4 \\ 5 \end{vmatrix}$

10. 4 from $\begin{vmatrix} 4 \\ 5 \end{vmatrix}$ 11. 3 from $\begin{vmatrix} 3 \\ 4 \\ 5 \\ 6 \end{vmatrix}$ 12. 2 from $\begin{vmatrix} 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \end{vmatrix}$ 13. 1 from $\begin{vmatrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \end{vmatrix}$

Seat-work: Use one-inch pegs.

Lay your pegs thus, ☐ How many such squares can you make?   How many pegs are left?

Lay 2 pegs on each side ☐ Each peg is 1 inch. Count the inches on one side.

On 2 sides (2×2). On 3 sides (3×2). On 4 sides (4×2).

LESSON XIX
Twelve and Combinations

36 **1.** Ten and two more are twelve.

2. Count out 12 sticks, and lay them in a group of ten and a group of two.

3. How many twos in ten? Then six twos = 12. $6 \times 2 = 12$.

4. Separate the 12 into two equal groups. What is each?

5. Six and six are twelve. $6 + 6 = 12$; $2 \times 6 = 12$.

6. Separate into threes. How many groups?

$$3 + 3 + 3 + 3 = 12; \quad 4 \times 3 = 12.$$

Into fours. $4 + 4 + 4 = 12$; $3 \times 4 = 12$; $\frac{1}{2}$ of $12 = 6$; $\frac{1}{3}$ of $12 = 4$; $\frac{1}{4}$ of $12 = 3$.

7. Take in turn 1, 2, 3, etc., away, then return. Place results in abstract form on board.
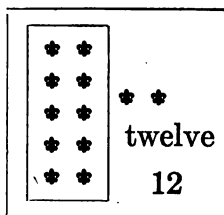
	1	$11 + 1 =$
	2	$10 + 2 =$
	3	$9 + 3 =$
	4	$8 + 4 =$
	5	$7 + 5 =$
$12 -$	$6 = ?$	$6 + 6 =$
	7	$5 + 7 =$
	8	$4 + 8 =$
	9	$3 + 9 =$
	10	$2 + 10 =$
	11	$1 + 11 =$

4—Pt. I

8. Add to 12 by 2's, 3's, 4's.
Begin at 1 and add by 2's, 3's, 4's, 5's.

Suggestions for teaching and concrete work:

12 things make a dozen.
12 inches make a foot.
12 months make a year.

Problems for Application

37 (1) The box is 3 inches less than a foot long. How long is it?

(2) The hen has in her nest 5 less than a dozen eggs. How many has she?

(3) At 4 cents a pint, what will 3 pints of milk cost?

(4) Suppose you bought a quart, how much change would come from a dime? How much more money would you need to get another pint?

(5) A square was 3 inches wide. How far would it be all around it? How many feet would that be?

(6) How many months in half a year?

(7) If you go to school 9 months each year, how many months do you not go?

(8) How many in half of a dozen and half of half a dozen?

(9) Separate 12 into as many different groups as you can.

(10) Separate 12 into as many combinations as you have learned.

```
      1          5
 +  2  3  6  0  7  11 10 15 21    12     12     12     12
    3  4  2  4  2  21 12 11 13   - 8    - 9    - 5    - 2
    4  3  3  1  2  15 14 11 14    ___    ___    ___    ___
    2  2  1  2  1  12 13 12 11
    _  _  _  _  _  __ __ __ __
```

NOTE.—A good opportunity to teach time from the clock is just after the number 12 has been taught. Then the Roman numerals can be easily and logically presented. Call attention to the two representations for 4, and the peculiarity of IIII on clock and watch faces. Counting by 5's at this time is also taken very readily, specifically used in telling time, and very practically used in many children's games.

LESSON XX

Combinations of 13 to 18

38 The development of the numbers from 13 to 18 will be found much easier than the preceding ones. The pupils will be familiar with the method, and so will grasp quickly the concrete presentation. Less concrete work need be given in presenting, but quite as much, perhaps more, drill in the combinations will be necessary.

Follow the plan already adopted of counting objects to the number being studied. Take first 1 away, then 2, etc., noting the complements, and getting the combinations, also the separations in abstract form. Thus $13 - 1 =$; $13 - 2 =$; $12 + 1 =$; $12 + 2 =$; etc. The halves of the even numbers should be taught, thirds of 15 and 18, and $\frac{1}{4}$ of 16.

The pupil should very early know that if 1 and 1 are 2, 11 and 1 will be 12, 21 and 1 will be 22, and so on; that certain combinations will always produce the same digit in the units line, and that the tens column will be built up at the same time.

When he has finally been taught the entire 45 combinations, and has by intelligent and constant practice learned them, he will, as all do, experience the joy of attainment. This knowledge can come, however, only through much drill; so do not hesitate to use tables, both oral and written. They are old-fashioned, to be sure, but very new-fashioned as well, and pedagogically correct.

LESSON XXI
Thirteen and Applications

39 1. I have 13 oranges. How many more than a dozen have I?

2. Our ball team won 9 games and lost 4. How many did it play?

3. 13 children wanted to go on the picnic. 3 were sick and could not go. How many went?

4. We found 8 eggs in the barn Monday and 5 Tuesday. How many did we find both days? How many more on Monday than on Tuesday?

5. 13 days are how many days more than a week?

6. John pays 3 cents carfare. How many rides can he pay for out of 13 cents? How many cents will he have left?

7. Mary has 13 examples to do. If she has done 11, how many has she yet to do?

8. In our garden are 5 apple trees, 6 pear trees, and 2 peach trees. How many trees are there?

9. Mary read 4 pages on Monday, 3 on Tuesday, and 6 on Wednesday. How many had she read in the 3 days?

10. William has a dime in his bank. How many more cents will make 13?

$$13 = \begin{vmatrix} 8+? \\ 9+? \\ ?+3 \\ ?+7 \end{vmatrix} \quad 13 = \begin{vmatrix} 4+5+? \\ 2+7+? \\ 1+6+? \\ 5+3+? \end{vmatrix} \quad 4+\begin{vmatrix} 7 \\ 3 \\ 9 \\ 6 \\ 2 \end{vmatrix} \quad 4 \text{ from } \begin{vmatrix} 13 \\ 11 \\ 5 \\ 8 \\ 9 \end{vmatrix}$$

	A	B	C	D
13 = 1 and how many 2's?	(1)	2 + 3 + 4 + 1		
1 " " " 4's?	(2)	3 + 1 + 5 + 2		
1 " " " 6's?	(3)	6 + 4 + 1 + 1		
3 " " " 5's?	(4)	2 + 0 + 2 + 8		
3 " " " 2's?	(Add vertically; also horizontally.)			

12	12	13	17	15	16	12	11
+15	13	10	11	12	13	11	12
11	14	13	11	11	10	13	16
—	10	12	10	10	—	12	—
	—	11	—	—		—	
		11					

LESSON XXII

Fourteen and Applications

40 **1.** How many days in a week? How many weeks are 14 days?

2. 14 cents are how many more cents than a dime?

3. Rose is 14 years old. Her brother is 5 years younger. How old is he?

4. I divided 14 cents equally between Mary and Jane. How many cents did I give each?

5. We rode 11 miles on the railway and 3 miles in a carriage. How far did we ride?

6. 14 little girls walked by 2's. How many 2's were there in line?

7. Charles had 8 marbles. William had 6 more. How many had William?

8. 14 children played ring. One was in the centre. How many were in the circle?

9. 14 little chicks were caught out in the rain. Only 9 were left. How many were drowned?

10. I have 14 oranges. How many more than a dozen have I?

Review

$14 = 7 + ?$	$14 = 7 \times ?$	$14 = 2 \times ?$	$13 = 6 + ?$	$13 - 6 = ?$
$12 = 6 + ?$	$12 = 6 \times ?$	$12 = 2 \times ?$	$11 = 6 + ?$	$11 - 6 = ?$
$10 = 5 + ?$	$10 = 5 \times ?$	$10 = 2 \times ?$	$9 = 6 + ?$	$9 - 6 = ?$
$9 = 3 + 3 + ?$	$9 = 3 \times ?$	$8 = 2 \times ?$	$7 = 6 + ?$	$7 - 6 = ?$
$8 = 4 + ?$	$8 = 4 \times ?$		$6 = 6 + ?$	$6 - 6 = ?$

Count by 2's to 14.   Begin with 1, add 2's to 13.

Count by 3's to 12.   Count by 4's to 12.

$\frac{1}{2}$ of 14 = $\frac{1}{3}$ of 12 = $\frac{1}{4}$ of 12 = $\frac{1}{4}$ of 8 =

$\frac{1}{2}$ of 10 = $\frac{1}{3}$ of 9 =

LESSON XXIII

Fifteen and Applications

41 **1.** If your father takes a 15-day trip, how many days more than 2 weeks is he away?

2. 3 boys have 5 marbles each. How many have all?

3. John caught 9 fish on Friday and 6 on Saturday. How many did he catch both days?

4. Our school team won 8 games and lost 7. How many games did it play?

5. 15 cents will pay how many 5-cent carfares? How many 3-cent fares?

6. 15 cents is how much more than a dime?

7. Harry had 15 marbles. If he lost $\frac{1}{3}$ of them, how many did he lose? How many did he keep?

8. Mary is saving 15 cents. She has 9 now. How many more does she need?

9. George gathered 8 eggs yesterday and 7 to-day. How many did he gather both days?

10. Mary is 15 years old, and her baby brother is 13 years younger. How old is baby brother?

Review

$\frac{1}{3}$ of $15 = ?$	$15 = 3 \times ?$	2	3	4	3	9
$\frac{1}{3}$ of $12 = ?$	$12 = 3 \times ?$	+3	+4	+5	+3	+3
$\frac{1}{3}$ of $9 = ?$	$9 = 3 \times ?$	4	6	3	2	2
$\frac{1}{3}$ of $3 = ?$	$3 = 3 \times ?$	5	2	2	5	1
		1				

9 from
| 15 |
| 13 |
| 11 |
| 9 |
| 10 |
| 12 |

5 and
| 10 |
| 8 |
| 6 |
| 4 |
| 2 |
| 9 |
| 7 |

LESSON XXIV

Sixteen and Applications

42 1. There are 8 desks in a row. Two pupils sit at each desk. How many pupils in a row? How many on the left side? How many on the right?

2. One-fourth of the pupils in a certain row are absent. How many pupils are absent? How many are present?

3. 2 pints make a quart. How many times can you fill the quart measure with 16 pints?

4. Our cow gave 16 quarts of milk. We kept 3 quarts for our use, and sold the rest to the neighbors. How many quarts did we sell?

5. A newsboy started out with 16 papers. He sold all but 1. How many did he sell?

6. Charles counted 9 birds in one tree and 7 birds in another. How many did he count in both?

7. The little fruit boy had 16 oranges. After he sold me a dozen, how many had he left?

8. How many times can you spend 5 cents, if you have 16 cents? How many will be left?

9. If I have 6 pennies and 1 dime, how much money have I?

10. How many pencils at 2 cents each can I buy for the money I have?

$\frac{1}{4}$ of 16 = ?   4 × ? = 16
$\frac{1}{4}$ of 4 = ?   4 × ? = 4
$\frac{1}{4}$ of 12 = ?   4 × ? = 12
$\frac{1}{4}$ of 8 = ?   4 × ? = 8

8 and
$$\begin{array}{c} 2 \\ 1 \\ 4 \\ 5 \\ 3 \\ 6 \\ 8 \\ 7 \end{array}$$
5 from
$$\begin{array}{c} 10 \\ 16 \\ 15 \\ 13 \\ 11 \\ 12 \\ 14 \\ 9 \end{array}$$

Count by 2's
     by 4's to 16

     by 3's
     by 5's to 15

$6 + 9 - 3 - 8 - 1 = ?$

$8 + 5 - 3 + 2 - 9 = ?$

$7 + 8 - 6 + 4 - 8 = ?$

LESSON XXV

Seventeen and Applications

43 **1.** John has 17 cents. How many half dimes is that worth? How much over?

2. He has 17 marbles. How much more than a dozen has he?

3. How much more than 2 weeks are 17 days?

4. Our baby is 17 months old. How much more than a year is that?

5. There are 8 eggs in one nest, and 9 in another. How many in both? How much less than a dozen in each?

6. There are 12 lambs in one fold, and 5 in another. How many in both? How many more in one than in the other?

7. A square is 4 inches on a side. How much less than 17 inches is it all around? 17 inches is how much more than a foot?

8. Add 2, 7, 3, and 2. Then add 3.

9. How many pints are there in 17 gills? How much over?

10. How many quarts in 17 pints? How much over?

```
 9 + ?│              │ 8      3    2    8    9    2    6    5    4
 2 + ?│              │ 3      4    3    2    1    1    6    5    4
11 + ?│              │ 7      5    4    1    1    3    3    1    4
 3 + ?│              │ 2      2    5    6    2    4    3    2    4
12 + ?│ = 17    17 − │ 9      1    3    0    2    5    3    3    1
 8 + ?│              │12 = ?  4    0    —    2    1    1    1    —
 1 + ?│              │10      —    —    —    1    —    —
 5 + ?│              │ 4
 6 + ?│              │ 1
10 + ?│              │ 5     11   24 .  11   13   16
       │              │11     12   13   12   24   11
                        13   11   13   20   12
                        11   11   11   11   10
                        12    —   12   11    —
```

Seat-work: From 17 sticks or pegs, get as many different equal groups as you can. Express results (and remainders) in figures. Cut a strip 17 inches long, 1 inch wide into inch squares. A strip 17 ×2 into 1 ×2 inch oblongs. Compare surfaces. Calculate length of edges. Compare with a foot.

LESSON XXVI
Eighteen and Applications

44 **1.** How many eggs in a dozen and a half?

2. How many half-dozens in 18?

3. What will 18 apples cost, if a half-dozen cost 5 cents?

4. How many carfares can you have for 18 cents?

5. The edge of my desk measures 18 inches. How much more than a foot is that?

6. If that big hen had 3 more chicks, she would have 18. How many has she?

7. Tom has 18 marbles. Dick has only one-third as many. How many has Dick?

8. Separate 18 into equal groups with nothing over. What will the groups be?

9. I want 18 cents. I have only 3 half-dimes. How much more must I have?

10. Anna had 18 flowers. She put 7 of them in one bunch. How many were left?

$$\begin{array}{c|c} \frac{1}{2} \\ \frac{1}{3} \end{array} \text{ of } 18 = ? \quad 18 - \begin{array}{c} 6 \\ 9 \\ 2 \\ 3 \\ 11 \\ 10 \\ 12 \\ 5 \\ 2 \\ 13 \end{array} = ? \quad \begin{array}{c} 2 \\ 9 \\ 3 \\ 12 \\ 18 \\ 4 \\ 7 \\ 1 \\ 5 \\ 6 \end{array} \text{ and } ? = 18$$

```
6   7   2   3   9   7   6   5   9   2
2   1   2   3   1   7   6   1   1   4
1   6   3   3   2   1   2   2   2   6
1   1   3   1   3   1   3   2   3   2
4   2   4   1   3   1   1  ·5   1   2
1   1   4   1   —   1   —   3   1   2
2   —   —   2   —       —   1   —
—           2
            2
            2
```

Review

Add:
1. 2, 3, 2, 4, 3, 3
2. 4, 1, 2, 6, 2, 1
3. 2, 1, 3, 2, 7, 3
4. 2, 1, 6, 5, 1, 1
5. 9, 1, 2, 3, 2, 1
6. 1, 2, 3, 4, 5, 2
7. 2, 1, 2, 7, 1, 2

8. Take

```
3
2
4    from 17, 9, 8, 12,
5        18, 10, 7, 11
6      (each in turn).
7
```

9.	10.	11.	12.
12	12	9	2
21	14	6	4
13	11	5	6
12	12	—	· 6
11	10		1

13. $2 \times$
2
4
6
8
1
3
5
7
9

14. ½ of
2
12
6
18
10
4
14
8
16

15. ⅓ of
6
9
18
12
15
3

16. ¼ of
16
4
12
8

17.
13
14
12
10

18.
6
6
6
2

Seat-work: Separate 18 sticks into equal groups. Express results in figures. Make a square, 3 by 3. Cut into inch squares. How many? Lay the squares in different shaped oblongs. How long and wide is each? Find distance around each oblong.

Begin at
1
2
3
4

and add by
2's
3's
4's
5's

Count by 2's, 3's, 4's, 5's, 6's
" " 5's to 50.

How many times can
you take........ 2 from 18, 12, 8, 16, 10, 4
3 " 12, 15, 9, 6, 18
4 " 16, 8, 4, 12, 20
5 " 20, 10, 5, 25, 15
10 " 50, 20, 40, 10, 30
6 " 18, 6, 12.

	1	2	3	4	5	6	7	8	9
1	2	3	4	5	6	7	8	9	
2	3	4	5	6	7	8	9		
3	4	5	6	7	8	9			
4	5	6	7	8	9				
5	6	7	8	9					
6	7	8	9						
7	8	9							
8	9								
9									

8
7
6
5
4 and 1;
3
2
1

7
6
5
4 and 2;
3
2

6
5
4 and 3;
3

5
4 and 4; 9 and 1;

8
9 and 2;

7
8 and 3;
9

6
7
8 and 4;
9

5
6
7 and 5;
8
9

6
7
8 and 6;
9

7
8 and 7;
9

8
9 and 8;

9 and 9

SECOND GRADE   **FIRST HALF YEAR**

LESSON I

Numbers from 20 to 99

1 **1.** I shall write a number with o in the *units* place and *1* in the *tens* place, which is 2 tens and 0 unit. How do you read it? Hereafter call the right-hand place the *units* place, not the *ones* place, and the figure in the right-hand place *units*, not *ones*. Add one unit to 20. What number do you get? Now add two units. What number do you get? Now, nine units. What number do you get?

Now, add one more unit.

Now, we have 9 units and 1 more unit, which make 10 units, or 1 ten, more than the 2 tens.

Now, we have 3 tens and no units, which we call *thirty*.

(In a similar way develop the numbers to 99.)

$$\begin{array}{r} 29 \\ + 1 \\ \hline 30 \end{array}$$

2. When we add 1 more unit to 99, we get 10 units, or
1 ten more than 9 tens, which will be   99
10 tens. We write it 100, and call it one   **+ 1**
hundred. This third place, where the 1 is, ——
we call the *hundreds* place.   **100**

3. Read:

20, 21......29
30, 31......39
40, 41......49
50, 51......59
60, 61......69
70, 71......79
80, 81......89
90, 91......99
100

4. Read:

20	30	40	50	60	70	80	90	100
21	31	41	51	61	71	81	91	
22	.	.	.	.	.	.	.	
23	.	.	.	.	.	.	.	
24	.	.	.	.	.	.	.	
25	.	.	.	.	.	.	.	
26	.	.	.	.	.	.	.	
27	.	.	.	.	.	.	.	
28	.	.	.	.	.	.	.	
29	39	49	59	69	79	89	99	

NOTE.—Thoroughness in the review of fundamentals is essential
to substantial progress. Insist on thorough drills.

Review and Drill—Combinations to 9

2 1.

1	2	3	4	5	6	7	8
1	1	1	1	1	1	1	1

2	3	4	5	6	7
2	2	2	2	2	2

3	4	5	6
3	3	3	3

4	5
4	4

2. $\begin{vmatrix} 3 \\ 6 \\ 2 \\ 7 \\ 5 \\ 8 \\ 4 \\ 1 \end{vmatrix} + ? = 9;$ **3.** $\begin{vmatrix} 2 \\ 8 \\ 1 \\ 7 \\ 4 \\ 5 \\ 3 \\ 6 \end{vmatrix} + ? = 8;$ **4.** $\begin{vmatrix} 1 \\ 7 \\ 3 \\ 5 \\ 6 \\ 2 \\ 4 \end{vmatrix} + ? = 7;$ **5.** $\begin{vmatrix} 4 \\ 6 \\ 8 \\ 9 \\ 7 \\ 5 \\ 3 \end{vmatrix} - 3 = ?;$

6. $\begin{vmatrix} 5 \\ 7 \\ 9 \\ 8 \\ 6 \\ 4 \end{vmatrix} - 4 = ?;$ **7.** $\begin{vmatrix} 6 \\ 8 \\ 9 \\ 7 \\ 5 \end{vmatrix} - 5 = ?;$ **8.** $\begin{vmatrix} 2 \\ 4 \\ 1 \\ 3 \end{vmatrix} + ? = 4;$ **9.** $\begin{vmatrix} 4 \\ 2 \\ 1 \\ 5 \\ 3 \end{vmatrix} + ? = 5;$

10. $\begin{vmatrix} 6 \\ 1 \\ 5 \\ 2 \\ 3 \\ 4 \end{vmatrix} + ? = 6;$ **11.** $3 \times \begin{vmatrix} 3 \\ 1 \\ 2 \end{vmatrix} = ?;$ **12.** $2 \times \begin{vmatrix} 1 \\ 2 \\ 3 \\ 4 \end{vmatrix} = ?$ **13.** $4 \times \begin{vmatrix} 1 \\ 2 \end{vmatrix} = ?$

14.
$$\begin{array}{cccc} 9 & 6 & 8 & 7 \\ -6 & -6 & -6 & -6 \\ \hline \end{array}$$

15.
$$\begin{array}{ccccc} 9 & 7 & 8 & 9 & 8 \\ -7 & -7 & -7 & -8 & -8 \\ \hline \end{array}$$

16. $\tfrac{1}{2} \text{ of } \begin{vmatrix} 2 \\ 4 \\ 6 \\ 8 \end{vmatrix} = ?;$ **17.** $\tfrac{1}{3} \text{ of } \begin{vmatrix} 9 \\ 3 \\ 6 \end{vmatrix} = ?;$ **18.** $\tfrac{1}{4} \text{ of } \begin{vmatrix} 4 \\ 8 \end{vmatrix} = ?$

19. Adding the same unit figure:

1	11	21	31	41		91
5	5	5	5	5	and so on to	5
6	16	26	36	46		96
3	3	3	3	3	and so on to	3

Continue such exercises involving combinations not exceeding 9 in the units place.

3 Seat-work: (1) Write the numbers from 1 to 100.

(2) Copy from the board the numbers in any desired arrangement.

(3) Begin at 0; add by 1's to 30; by 2's to 30; by 3's to 30.

(4) Write all the ways you can make 9.

(5) Subtract from 9 in as many ways as you can. From 8. From 7, etc.

LESSON II

Review of 10, 11, 12

4 **1.**
1	2	3	4	5	6	7	8	9
9	8	7	6	5	4	3	2	1

2.
1	2	3	4	5	6	7	8	9	10
10	9	8	7	6	5	4	3	2	1

3.
1	2	3	4	5	6	7	8	9	10	11
11	10	9	8	7	6	5	4	3	2	1

4. $\begin{matrix} 3 \\ \times 2 \end{matrix}$ $\begin{matrix} 3 \\ \times 3 \end{matrix}$ $\begin{matrix} 3 \\ \times 4 \end{matrix}$ **5.** $\begin{matrix} 2 \\ \times 2 \end{matrix}$ $\begin{matrix} 2 \\ \times 3 \end{matrix}$ $\begin{matrix} 2 \\ \times 4 \end{matrix}$ $\begin{matrix} 2 \\ \times 5 \end{matrix}$ $\begin{matrix} 2 \\ \times 6 \end{matrix}$ **6.** $\begin{matrix} 4 \\ \times 2 \end{matrix}$ $\begin{matrix} 4 \\ \times 3 \end{matrix}$

7. $\begin{matrix} 6 \\ 5 \\ 2 \\ 7 \\ 1 \\ 4 \\ 3 \end{matrix} +3 = ?;$ **8.** $\begin{matrix} 5 \\ 6 \\ 2 \\ 3 \\ 4 \\ 1 \end{matrix} +5 = ?;$ **9.** $\begin{matrix} 5 \\ 3 \\ 4 \\ 2 \\ 1 \\ 6 \end{matrix} +6 = ?;$ **10.** $\begin{matrix} 12 \\ 7 \\ 6 \\ 9 \\ 8 \\ 11 \\ 10 \\ 5 \end{matrix} -4 = ?;$

11. $\frac{1}{2}$ of $\begin{matrix} 8 \\ 6 \\ 12 \\ 10 \\ 4 \\ 2 \end{matrix} = ?;$ **12.** $\frac{1}{3}$ of $\begin{matrix} 9 \\ 12 \\ 3 \\ 6 \end{matrix} = ?;$ $\frac{1}{4}$ of $\begin{matrix} 8 \\ 4 \\ 12 \end{matrix} = ?$

13.
```
12  11  10  12  11  10  12  11  10  12  11  10
-9  -7  -8  -8  -6  -6  -7  -8  -9  -6  -9  -7
```

14. Take 2 from $\begin{vmatrix} 10 \\ 11 \\ 12 \end{vmatrix}$; take 3; take 4; and so on to 9.

Adding numbers of 2 orders, the sum of the units exceeding 9:

5 Operation
```
   24
  +13
   13
   (1)
```
$\overline{50}$ =sum

Proof-check
```
   10
    4
```
$\overline{50}$

What is the sum of the units column?

Ten units make how many tens?

How many tens and how many units over?

Then the sum of the units is one ten and no units.

Write the no units (0 units) under the *units* column, and the 1 ten in the *tens* column. Now add the tens column. 5 tens. Write 5 under the *tens* column. The sum is 5 tens and 0 units, which we read—50. Now, we shall add another way to show that this sum is correct. How many units do 4+3+3 units make? 10 units make how many tens? One ten and how many units more? Then write 1 ten and 0 units. How many tens do 2+1+1 tens make? 4 tens. Write 4 tens under the 1 ten, and we get 5 tens. The sum is 5 tens and 0 units,

which we read—50. We add in this way whenever the sum of the units makes more than one ten. Let us add some more:

I.	2.	3.	4.	5.	6.
15	13	11	19	17	12
+16	+12	+13	+18	+16	+14
18	19	17	11	15	16

7.	8.	9.	10.	11.	12.
10	11	12	13	24	25
+25	+24	+26	+27	+16	+13
17	18	12	15	11	12

(Continue this drill with numerous examples. Check each addition, thus insuring accuracy.)

Problems

6 (1) January has 31 days; February, 28; March, 31. How many days in the 3 months?

(2) I read 25 pages on Monday, 26 on Tuesday, and 12 on Wednesday. How many have I read?

(3) The farmer brought us 24 eggs last week and 36 this week. How many did he bring in 2 weeks?

(4) Our orchard has 16 apple trees, 17 pear trees, and 15 peach trees. How many trees have we?

(5) I spent 15 cents for sugar, 18 cents for tea, and 36 cents for coffee. How many cents did I spend?

(6) John is 16 years old. His father is 25 years older. How old is his father?

(7) Charles rode on his wheel 17 miles, and on the train 24 miles. How far did he ride?

(8) A newsboy sold 17 morning papers and 18 afternoon papers. How many did he sell?

(9) Mary spelled 29 words right and 16 words wrong. How many words did she spell?

(10) William saw 14 birds on his way to school and 17 on his way home. How many birds did he see?

7 Seat-work: (1) Lay 12 pegs in 2 equal groups; in 3; in 4.

(2) Separate 12 pegs into 2 groups in as many ways as you can.

(3) Copy these numbers from the board: 5, 15, 25, 35, 45, to 95.

(4) Add 4 to each; add 3; add 2, etc.

(5) Write in a column all the numbers from 50 to 59; 60 to 69, etc., to 90 to 99.

(6) Copy these numbers from the board. Add them both ways. (2 columns.)

LESSON III

Inch—Foot—Yard

8 (The pupils should be supplied with 12-inch rulers; when possible, with a yard stick.)

1. Look at your ruler and see that it is marked off into 12 small divisions. .Do you remember what each little part is called?

2. What is the name of the 12 inches all together?

3. Now think that 12 inches make 1 foot, and 1 foot equals 12 inches.

4. Come to the board and measure off 3 feet. That length is called a yard. These measures are used to measure the lengths of many different things.

5. Can you find how many inches in 1 yard?

$$12$$
$$12$$
$$\underline{12}$$

$3 \times 12 = 36$

6. What will $\frac{1}{2}$ of 12 inches be?
   $\frac{1}{3}$ of 12 inches be?
   $\frac{2}{3}$ of 12 inches be?
   $\frac{1}{4}$ of 12 inches be?
   $\frac{2}{4}$ of 12 inches be?
   $\frac{3}{4}$ of 12 inches be?

7.

How many inches in

1 foot?
$1\frac{1}{2}$ feet?
2 feet?
$2\frac{1}{2}$ feet?
3 feet?
1 yard?

NOTE.—Show the relation between $\frac{1}{4}$ and $\frac{2}{8}$; $\frac{1}{4}$, $\frac{2}{4}$, and $\frac{3}{4}$.

9 Drill:

8. $\left.\begin{array}{l}\frac{1}{2}\\\frac{1}{4}\\\frac{2}{4}\\\frac{3}{4}\\\frac{1}{3}\\\frac{2}{3}\end{array}\right|$ of $12 = ?$

9. $\begin{array}{r} 12 \\ +\ 6 \\ \hline \end{array}$

10. $\begin{array}{r} 14 \\ +\ 6 \\ \hline \end{array}$

11. $\begin{array}{l} 12\ \text{in.} \\ +12\ \text{in.} \\ 12\ \text{in. (5 ft.)} \\ 12\ \text{in.} \\ 12\ \text{in.} \\ \hline \end{array}$

12. $2\times \left|\begin{array}{l}1\\3\\6\\5\\4\\2\\10\end{array}\right. = ?$

13. $3\times \left|\begin{array}{l}1\\3\\4\\2\\10\\12\end{array}\right. = ?$

14.	15.	16.	17.	18.	19.	20.	21.	22.	23.
12	22	32	42	52	24	34	44	54	64
6	6	6	6	6	6	6	6	6	6

24. $12 - \left|\begin{array}{l}6\\3\\9\\2\\5\\4\\7\\1\\8\end{array}\right. = ?$

25. $11 - \left|\begin{array}{l}4\\9\\5\\6\\8\\3\\2\\1\\7\end{array}\right. = ?$

26. $10 - \left|\begin{array}{l}2\\4\\6\\8\\9\\7\\5\\3\\1\end{array}\right. = ?$

10   Practical application: (1) Tom made an oblong 7 inches on one side and 8 inches on the other. How many inches all the way around it?

(2) I have 17 inches of ribbon. How much more than a foot is it?

(3) How much more than 9 inches is it?

(4) I made a square 5 inches on a side. How many inches all around it?

(5) May has 36 inches of lace for her doll, and I give her 6 inches more. How many has she then?

(6) Add in inches: $\frac{1}{2}$ of a foot, $\frac{1}{3}$ of a foot, $\frac{1}{4}$ of a foot.

(7) If the little plant was 8 inches high, and then grew 4 more inches, how tall would it be? Say it two ways.

(8) How many inches in a foot, half a foot, and 4 inches?

(9) What is $\frac{1}{3}$ of 36 inches? $\frac{2}{3}$ of 36 inches?

(10) Add 17 inches and 7 inches.

(11) How many feet will that be?

(12) Six is what part of 12? Three is what part of 12? Four is what part of 12?

11 Seat-work: (1) Measure the length of your desk in inches; in feet.

(2) Cut a strip of paper 8 inches long, 4 wide. How many feet all around its edge?

(3) How many feet and how many inches over in 16 inches; in 20 inches; in 25 inches; in 30 inches?

(4) Make squares of various sizes. Compute the distance around in inches; also in feet.

(5) Measure each other's height, and express in inches, or feet, or yards.

LESSON IV

Review of 13, 14, 15

12

1.	2.	3.	4.	5.	6.	7.	8.
9	8	7	9	8	7	9	8
4	5	6	5	6	7	6	7

The dozen:

12 things make a dozen

6 "   " ½ "

9.

9
0
1
8
2
7 $+? = 13;$
3
6
4
5

10.

1
3
5
7
9
8 $+? = 14;$
6
4
2
0

11.

9
8
7
4
5
6 $+? = 15$
0
1
2
3

12.	13.	14.	15.	16.	17.
15	15	15	15	15	15
− 6	− 9	− 7	− 4	−12	− 8

18.	19.	20.	21.	22.	23.	24.
14	14	14	14	14	14	14
− 9	− 7	− 6	− 4	− 8	− 5	− 3

25.	26.	27.	28.	29.	30.	31.	32.
13	13	13	13	13	13	13	13
− 4	− 5	− 9	− 6	− 8	− 7	− 3	−10

33. $\frac{1}{2}$ of 14 = ?   34.   9   19   29
    $\frac{1}{3}$ of 15 = ?   +5   + 5   + 5
    $\frac{2}{3}$ of 15 = ?

35.   89   36.   7   17   27   37.   87
      + 5   +6   + 6   + 6   + 6

Suggestion: Give many drills similar to above involving the
   addition of the same unit figures.   Such addition should
   become automatic.

38. How many things in a dozen? In $\frac{1}{2}$ dozen? In $\frac{1}{3}$
dozen? In $\frac{2}{3}$ dozen? In $\frac{1}{4}$ dozen? In $\frac{2}{4}$ dozen? In
$\frac{3}{4}$ dozen? In 1 dozen and $\frac{1}{2}$ dozen?

13 1. Reading numbers of 3 orders.
      The first order is called units; the second, tens;
      the third, hundreds. When we have 10 units,
      what do we call it? Where do we place this ten?
      When we get 10 tens, what do we call it? Where
      do we place it?

      Illustration: 9 units + 1 unit = 1 ten
                       19 units + 1 unit = 2 tens
                       99 units + 1 unit = 1 hundred

2. Read: 101   210   118   184   993   814
          110   299   275   150   107   902
          199   300   689   672   290   871
          200   354   453   894   416   713

(Give thorough drill in reading numbers from figures
and in writing numbers from words. Review often
that 10 of an order make 1 of the next order to the
left. This will make perfectly easy and natural the
adding of numbers of three figures.)

	161		check
	138		13
	214		10
	(1)(1)		4
	513 = sum		513

NOTE.—Review form and use of check. Have pupils read
addends and sum.

Add:

3. 145	4. 218	5. 143	6. 278	7. 614	8. 118
138	176	179	114	145	293
112	251	133	233	175	105

9. 21	10. 714	11. 192	12. 114	13. 113	14. 134
68	87	114	172	118	217
143	14	116	219	146	145
				112	111

LESSON V

Subtraction

14 **1.** 2 and 3 are how many?   2 and how many are 5?
2 + ? = 5.

4 and 5 are how many?   4 and how many are 9?
4 + ? = 9.

$\begin{array}{r} 95 \\ -42 \\ \hline 53 \end{array}$ 2 units and how many units make 5 units?
Put 3 under the units.

4 tens and how many tens make 9 tens?
Put 5 under the tens.

We read this: From 95 take away (subtract) 42.
What do we call the sign (−)?   What does *minus*
mean?   In subtraction we call the number
from which we subtract, the minuend; the num-
ber we subtract, the subtrahend; the result,
the remainder or difference.

Operation   Proof-check
So   95 = the minuend   53
     −42 = the subtrahend   +42
     53 = the remainder or difference   95

If we take 42 from 95, how many will be left?   53
added to what number will make 95?   Add them
and see.   They do make 95.   This proves that
the subtraction is correct.

6—Pt. I

76   From 6 units take 5 units. 5 units and how
−35   many units make 6 units? Place 1 in the
—   *units* column.   From 7 tens take 3 tens.
41   3 tens and how many tens make 7 tens?
     Place 4 in the *tens* column. From 76 take
     away 35. What number must be added
     to 35 to make 76? 41+35 =76. Right.

2. Do these subtractions and check the results.

99	87	65	58	46	36 ·	23
−82	−63	−41	−35	−25 ·	−16	−11

	39	48	51	45	67 ·
	−26	−16	−31	−24	−33

(Give numerous examples, involving all the com-
binations to 9. Drill for rapidity in getting the
complement of the number to be subtracted.
Thus: 2 and ? make 9. 2 from 9 leaves what?)

15 Application: (1) What number must be added to 27
to make 59?

(2) How much greater is 87 than 52?

(3) How much less is 34 than 48?

(3) From a barrel holding 63 gallons of vinegar a grocer
sold 51 gallons. How many gallons remained?

(5) Out of 3 quarter-dollars I paid 53 cents for fruit.
How many cents change should I get?

(6) My book has 98 pages. If I have read 63 pages, how many have I yet to read?

(7) February has 28 days. How many days are left after the 15th?

(8) From 6 dozen eggs we sold 60. How many are left?

(9) 24 oranges were sold from a pile containing 66. How many were left?

(10) There are 48 children in room A and 27 in room B. How many more in room A?

16 Drill:

8	18	28	38	and so on to	98
−2	− 2	− 2	− 2		− 2

9	19	29	39	and so on to	99
−5	− 5	− 5	− 5		− 5

7	17	27	37	and so on to	97
−4	− 4	− 4	− 4		− 4

17 Seat-work suggestions: (1) Represent numbers of two orders with sticks, pegs, etc., laid in tens and ones. Take away units from units, and tens from tens. The remainder represents what number?

(2) Copy from the board two-lined subtractions, writing the names of the terms. (This will lead to familiarity with the terms of subtraction.)

LESSON VI

Pint—Quart—Gallon

NOTE.—Show both a pint and a quart measure at the same time, that the 1 : 2 relation may be plain.

18   What do we call this measure?   (Indicating the smaller.)

What do we call this one?   (Indicating the larger.)

Sometimes we need a larger measure. We call this a gallon measure. (Fill the gallon measure with sand by using the quart cup four times.) How many pints are needed to fill the quart measure? How many quarts are needed to fill the gallon measure?

Then: 2 pints make 1 quart.   2 pt. = 1 qt.
        4 quarts make 1 gallon   4 qt. = 1 gal.

How many times must you use the pint measure to fill the gallon measure?

Then how many pints make 1 gallon?

How many quarts in 1 gallon? In 2 gallons? In 3 gallons? In 4? In 5?

How many pints in 1 gallon? In 2 gallons? In 3 gallons? In 4? In 5?

Then 4   4   4

$\dfrac{4}{8}$ $\dfrac{4}{}\begin{array}{c}4\\4\\ \hline 12\end{array}$ $\dfrac{\begin{array}{c}4\\4\\4\end{array}}{16}$ or $2\times4=8$; $3\times4=12$; $4\times4=16$

And   8   8   8

$\dfrac{8}{16}$ $\dfrac{}{\begin{array}{c}8\\8\\ \hline 24\end{array}}$ $\dfrac{\begin{array}{c}8\\8\\8\end{array}}{32}$ or $2\times8=16$; $3\times8=24$; $4\times8=32$

How many times must you fill the quart measure to make a gallon?

A quart is what part of a gallon? 2 quarts? 3 quarts?

How many times must you fill the pint measure to make a gallon?

A pint is what part of a gallon? 2 pints? 4 pints?

1 is what part of 4? 1 is what part of 8?

$\frac{1}{2}$ of a gallon equals how many quarts? How many pints? $\frac{1}{2}$ of $4=?$; $\frac{1}{2}$ of 8?

$\frac{1}{4}$ of a gallon equals how [many quarts? How many pints? $\frac{1}{4}$ of 4; $\frac{1}{4}$ of 8.

$\frac{1}{8}$ of a gallon equals how many pints? $\frac{1}{8}$ of 8.

8 quarts make how many gallons?   8
    12 quarts?   12 $=?\times4$
    16 quarts?   16

8 pints make how many gallons?
   16 pints? 24 pints? 32 pints?

$$\left. \begin{array}{r} 8 \\ 16 \\ 24 \\ 32 \end{array} \right| = ? \times 8$$

2 pints make how many quarts?
   4 pints? 6 pints? 8 pints?

$$\left. \begin{array}{r} 2 \\ 4 \\ 6 \\ 8 \end{array} \right| = ? \times 2$$

19 Application: (1) Seven pints will make how many quarts and how many pints?

(2) Three quarts will make how many pints?

(3) The milk dealer put 4 gallons of milk into pint bottles. How many bottles did he fill?

(4) From a gallon of preserves we sold 5 pints. How many pints are left?

(5) The grocer sold 2 gallons of vinegar at 5 cents a quart. How much did he get?

(6) One gallon and 3 quarts are how many quarts? How many pints?

(7) At 9 cents a quart, a gallon will cost how much?

(8) At 32 cents a gallon, how much will a quart cost? A pint?

(9) From 10 gallons of milk we sold 23 quarts. How many quarts were left?

(10) From 3 gallons of milk we sold 19 pints. How many pints were left?

20 Drill:

1. $2 \times \begin{vmatrix} 2 \\ 3 \\ 4 \\ 5 \end{vmatrix} = ?$ 2. $4 \times \begin{vmatrix} 2 \\ 3 \\ 4 \\ 5 \end{vmatrix} = ?$ 3. $8 \times \begin{vmatrix} 2 \\ 3 \\ 4 \\ 5 \end{vmatrix} = ?$ 4. $\frac{1}{2} \text{ of } \begin{vmatrix} 2 \\ 4 \\ 8 \end{vmatrix} = ?$

5. $\frac{1}{4} \text{ of } \begin{vmatrix} 4 \\ 8 \end{vmatrix} = ?$ 6. $\frac{1}{8} \text{ of } \begin{vmatrix} 8 \\ 16 \\ 24 \\ 32 \\ 40 \end{vmatrix} = ?$

7. $2 \times ? = 8$
   $4 \times ? = 12$
   $8 \times ? = 16$

8. $\frac{1}{2} \text{ of } ? = 2$
   $\frac{1}{4} \text{ of } 8 = ?$
   $\frac{1}{8} \text{ of } ? = 2$

9.	10.	11.	12.	13.	14.
8	4	2	4	2	8
×3	×2	×5	×3	×7	×4

15. Count by 2's to 40; by 4's; by 8's.
16. Count back from 40 by 2's; by 4's; by 8's.

21   Review Drill

```
9  1  6  4  2

         8

+        1

         5

 5       7
```

NOTE.—Use the figure in the small square as addend to the figures in the large square. Change the figure to get other combinations. Extend the exercise by using 19, 29, 39, etc.; 11, 21, 31, etc. Extend the exercise further by reversing the combination, adding 9 to 5, 15, 25 and so on; 1 to 5, 15, 25, etc.

Use the word *from* in the centre, and add 1 ten when needed; 5 from 9; 5 from 11, etc. Extend the exercises by using the numbers in the large square as subtrahend, adding 1 ten to number in small square when necessary.

If care be used with the numbers in the large square, the multipliers 2, 3, and 4 may be used in the small square.

1. $\frac{1}{2}$ of $\begin{vmatrix} 10 \\ 20 \\ 24 \\ 18 \\ 12 \\ 8 \\ 16 \\ 6 \\ 4 \\ 14 \end{vmatrix} = ?$ **2.** $\frac{1}{3}$ of $\begin{vmatrix} 9 \\ 12 \\ 6 \\ 15 \\ 18 \\ 3 \end{vmatrix} = ?$ **3.** $\frac{1}{4}$ of $\begin{vmatrix} 8 \\ 12 \\ 16 \\ 4 \\ 20 \end{vmatrix} = ?$

4.	5.	6.	7.	8.	9.
168	258	143	143	123	143
211	164	123	614	178	148
179	217	164	175	139	125
——	——	219	——	——	113
		——			——

10. Read: 49, 143, 217, 59, 105, 178, 95, 773.

29	73	48	77	49	24	33	21
−15	−51	−13	−14	−23	× 2	× 3	× 4
——	——	——	——	——	——	——	——

NOTE.—Read all results. Strive for rapid calculation.

LESSON VII

22   Review of 16, 17, 18

1. $\begin{array}{r} 7 \\ +9 \\ \hline \end{array}$ 2. $\begin{array}{r} 8 \\ +8 \\ \hline \end{array}$ 3. $\begin{array}{r} 9 \\ +7 \\ \hline \end{array}$ 4. $\begin{array}{r} 8 \\ +9 \\ \hline \end{array}$ 5. $\begin{array}{r} 9 \\ +8 \\ \hline \end{array}$ 6. $\begin{array}{r} 9 \\ +9 \\ \hline \end{array}$

7.

$8+9=$
$9+7=$
$8+8=$
$9+9=$
$7+9=$
$9+8=$

8. $16 - \begin{vmatrix} 5 \\ 9 \\ 6 \\ 8 \\ 5 \\ 7 \\ 3 \\ 1 \\ 4 \end{vmatrix} = ?$

9. $17 - \begin{vmatrix} 4 \\ 9 \\ 8 \\ 2 \\ 9 \\ 7 \\ 5 \\ 3 \\ 1 \\ 0 \end{vmatrix} = ?$

10. $18 - \begin{vmatrix} 0 \\ 2 \\ 4 \\ 6 \\ 8 \\ 1 \\ 3 \\ 5 \\ 7 \\ 9 \end{vmatrix} = ?$

11. $2 \times \begin{vmatrix} 2 \\ 4 \\ 6 \\ 8 \\ 1 \\ 2 \\ 3 \\ 5 \\ 7 \\ 9 \end{vmatrix} = ?$

12. $3 \times \begin{vmatrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \end{vmatrix} = ?$

13. $4 \times \begin{vmatrix} 0 \\ 1 \\ 2 \\ 3 \\ 4 \end{vmatrix} = ?$

14. $\frac{1}{2}$ of $16 =$
$\frac{1}{4}$ of $16 =$
$\frac{2}{4}$ of $16 =$
$\frac{3}{4}$ of $16 =$

15. $\frac{1}{3}$ of $18 =$
$\frac{2}{3}$ of $18 =$
$\frac{1}{2}$ of $18 =$

16.	2	9	7	6	8	5	4	3
	×2	×2	×2	×2	×2	×2	×2	×2

17.		1	4	6	2	3	5
		×3	×3	×3	×3	×3	×3

18.	7	17	27	to	87	19.	8	18	28	to	88
	+9	+ 9	+ 9		+ 9		+ 7	+ 7	+ 7		+ 7

23   Give frequent and thorough drill in adding the same unit figures as above; strive for the automatic work— "true addition."
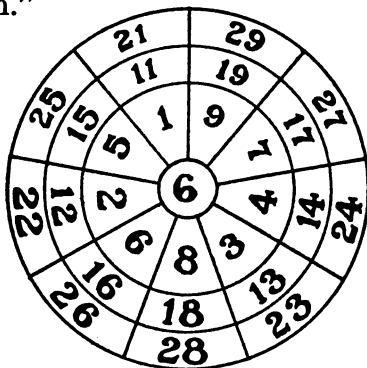
NOTE.—Add the central figure to those in the outer rings. Change the central figure and so introduce every combination over and over. Much drill may be effected thus: 9 and 6, 19 and 6, 29 and 6, and so on.

Subtract the central figure from the outer ones, combining 1 ten with the minuend when the subtrahend exceeds it, thus: 9−6, 7−6, 14−6, 13−6, and so on. This will be a good preparation for the "carrying" process to be taught in the succeeding term.

Ounces—Pounds

Next time you go to the store, notice the different sized weights the grocer uses. Perhaps he will show you an ounce and a pound weight. They look something like this: When groceries are bought in very 1 oz. small quantities— such things as pepper or spices— they are bought by the ounce. Such things as sugar or coffee or meal are bought by the pound. It takes 16 of these little ounces to weigh 1 pound.

16 ounces = 1 pound.

16 oz. = 1 lb.

How many ounces in ½ pound?

"   "   "   in ¼ pound?

"   "   "   in ¾ pound?   in ¾ pound?

8 oz. = what part of a lb.?

4 oz. = what part of a lb.?

1 lb. −8 oz. =what part of a lb.?

1 lb. −4 oz. =how many ounces?

8 oz. −4 oz. =what part of a lb.?

24 Application: (1) How many oz. in a lb.? in a half lb.? in a quarter of a lb.?

(2) I paid 8 cts. for an oz. of spice; what would 3 oz. cost?

(3) How much more are 12 oz. than one-half of a lb.?

(4) At 5 cts. an oz. what would 4 oz. cost? 8 oz.? a whole lb.?

(5) Add 8 oz., 6 oz., 4 oz.

(6) How much more than a lb. will that be?

(7) Add 25 oz., 16 oz. and 14 oz.

(8) How much more in a lb. than 9 oz.?

(9) What is left when you take 2 oz. from 18 oz.?

(10) How many ounces in 2 pounds?

25   **Review Drill**

1. 5		**2.** 4		**3.** 3	
15		14		13	
25		24		23	
35	+6 =?	34	+9 =?	33	+7 =?
to		to		to	
95		94		93	

4. 9		**5.** 8		**6.** 7	
19		18		17	
29	−3 =?	28	−2 =?	27	−4 =?
to		to		to	
99		98		97	

(And so on. Vary the unit figure in the column, and change the addend or subtrahend to secure all desired combinations.)

7. 2	6	5	4		
2	6	5	4		6×2
2	—	5	4		2×6 = the same
2		5	4	to show	
2		5	4	that	4×5
2		—	4		5×4 = the same
2			—		

8. 2×3
3×2
4×2
2×4
5×3
3×5
3×6
6×3
2×6
6×2
2×9
9×2
2×7
7×2
2×8
8×2
$=?$

Suggestion: Show that $\frac{1}{2}$ of $2=1$, whether in the units or tens or hundreds place.

$2=$ what part of 8?
4?
6?
2?

$3=$ what part of 6?
9?
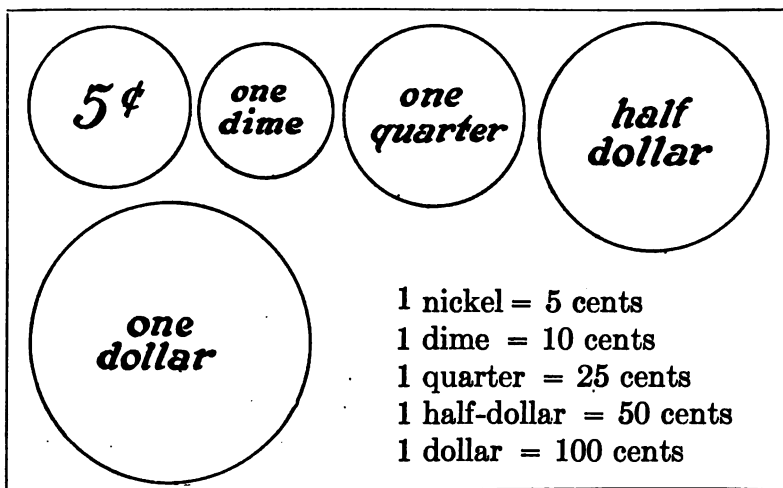12?

$4=$ what part of 8?
12?
16?
4?
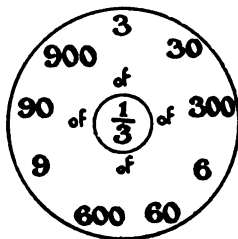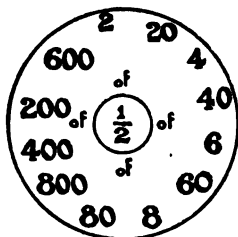
LESSON VIII

United States Money

26   A convenient way to express our money in figures is to use a dollar mark ($) to show dollars, and to separate cents from dollars by a period, thus: $1.25. Always give two places to cents, this way: $1.05.

5 ¢   one dime   one quarter   half dollar

one dollar

1 nickel = 5 cents
1 dime = 10 cents
1 quarter = 25 cents
1 half-dollar = 50 cents
1 dollar = 100 cents

Read:

$ .65
.26
.94
1.10
2.93, etc.

Write on the board (or on your paper) in figures, ten cents, forty cents, one dollar and five cents. (Give considerable practice in reading from the figures.)

How many nickels is a dime worth? A quarter of a dollar?

How many quarters is a dollar worth? A half-dollar?

50 cents is what part of a dollar?

25 cents is what part of a dollar?

5 cents is what part of a dime?

How many nickels is a quarter worth?

How many dimes is a dollar worth?

How many dimes is a half-dollar worth?

27 Application: (1) Add a dollar, a quarter, a dime, a nickel.

(2) Add $0.25, $0.40, $0.27, $0.05.

(3) I paid $0.14 for one thing, and $0.27 for another. How much for both?

(4) I had a quarter, and spent 8 cents. How much had I left?

(5) John had 65 cents and earned 19 cents more. How many had he then?

(6) A boy had a quarter, 16 cents, and 7 dimes. How much was that?

(7) A newsboy had 17 cents. How much did he need to have a quarter of a dollar?

(8) Mary sold her eggs for 27 cents. How much less than a dollar is that?

(9) Take 13 cents away from 87 cents.

(10) Emma's mother bought two dozen eggs at 27 cents
a dozen. What did she have to pay?

NOTE.—To acquire skill in computing small amounts of pur-
chase, and in making change, pupils should use freely and fre-
quently actual or *school money.*

General Review

28 Add:

1. 2 to 1, 3, 5, 7, 9, 8, 6, 4, 2, 0
2. 4 to 0, 2, 4, 6, 8, 1, 3, 5, 7, 9
3. 6 to 9, 0, 1, ·8, 2, 7, 3, 6, 5, 4
4. 8 to 0, 5, 1, 9, 2, 8, 3, 7, 4, 6
5. 9 to 1, 2, 3, 4, 5, 6, 7, 8, 9
6. 7 to 9, 7, 5, 8, 6, 4, 0, 3, 2, 1
7. 5 to 7, 4, 1, 8, 5, 2, 9, 3, 6, 0
8. 3 to 1, 5, 9, 2, 6, 3, 7, 4, 8

9.
```
2
4
6        18, 14,
8        19, 12,
Take 3 from 15, 10, in turn.
1        16, 13,
7        11, 17,
5
9
```

10. How many | pints in 1 qt.?
qts. in 1 gal.?
pts. in 1 gal.?

11. ½ of 16 oz.
¼ of 16 oz.
¾ of 16 oz. = ?
⅜ of 16 oz.

12. 16 oz.
4 oz.
8 oz. = what part of a lb.?
12 oz.

13.

A pint is what part of 1 qt.?
" qt. "   "   " of 1 gal.?
" pt. "   "   " of 1 gal.?

14.

1 foot = how many inches?
2 feet = how many inches?
3 feet = how many inches?

15. $\frac{1}{2}$ of 100 cts.
$\frac{1}{4}$ of a dollar
$\frac{2}{4}$ of a dollar = how many cents?
$\frac{3}{4}$ of a dollar
$\frac{1}{2}$ of a dime

16. $\frac{1}{2}$ of 12 inches
$\frac{1}{3}$ of 12 inches
$\frac{2}{3}$ of 12 inches
$\frac{1}{4}$ of 12 inches = ?
$\frac{2}{4}$ of 12 inches
$\frac{3}{4}$ of 12 inches

17. 2×2
4×3
6×2
3×4
2×7
7×2 = ?
4×4
4×5
5×4
2×7
3×7

18. 5 dimes
5 nickels
4 quarters = how many cents?
2 half-dollars
10 dimes

SECOND GRADE   **SECOND HALF YEAR**

LESSON I

29 Operation

Hundreds	Tens	Units

```
 2 3 4          Proof-check
+3 7 5             18
 1 4 9             14
 (1)(1)             6
 ─────            ───
 7 5 8 = sum      758
```

1.	**2.**	**3.**
135	315	473
+246	+264	+326
327	137	165

4.	**5.**	**6.**
296	123	569
+324	+456	+131
150	287	228

What does the plus sign (+) mean? How many numbers are to be added? Read the first. How many hundreds, how many tens, how many units?

Read the second number. How many hundreds, how many tens, how many units? Read the third number. How many hundreds, how many tens, how many units? Which is the *units* column? The *tens* column? The *hundreds* column? Let us add the *units* column. 9 units + 5 units + 4 units = 18 units = 1 ten and 8 units. Write 8 under the units column. Add 1 in the tens column. What is the sum of the tens column?   15

7.	8.	9.
369	123	204
+208	+282	+186
134	252	353
	125	135

tens, which make 1 hundred and 5 tens. Write the 5 tens under the tens column. Add 1 in the hundreds column. What is the sum of the hundreds column? Write 7 under the hundreds column. Read the sum of the three numbers. Let us prove this sum to show that it is correct. Sum of the units column = 18 units. Sum of the tens column = 14 tens. Sum of the hundreds column = 6. Add and the sum is 8 units, 5 tens, 7 hundreds. Read this sum.

10.	11.	12.
249	134	265
75	212	172
102	333	120
373	121	113

13.	14.	15.
122	29	151
+235	+406	+165
216	52	132
134	323	142

16.	17.	18.	19.	20.
205	182	334	234	152
+186	+ 63	+132	+ 98	+77
317	445	235	376	249
			105	102
			160	125

21.	22.	23.	24.	25.	26.
308	.199	250	167	324	219
+ 69	+ 33	+127	+254	+ 96	+108
214	208	141	136	87	127
52	115	53	221	201	206
143	141	85	112	152	132

Problems

30 (1) In our school there were present on Monday, 145 pupils; on Tuesday, 158; on Wednesday, 150; on Thursday, 149; on Friday, 155. How many pupils were present on five days?

(2) In the spring months there are 92 days; in the summer months, 92; in the autumn months, 91; in the winter months, 90. How many days are there in the year?

(3) In the last three years a farmer raised 255, 328, and 187 bushels of wheat. How many bushels did he raise in the three years?

(4) If your mother paid $1.25 for groceries, $0.85 for vegetables, and $1.58 for meat, how much did she spend?

(5) A   B   C   D ｜ How many miles
    . 125 mi. 200 mi. 318 mi. ｜ is it from A to D?

(6) If our dairyman sold during the first week of March 175 pounds of butter; during the second, 189

pounds; during the third, 196 pounds; during the fourth, 250 pounds, how many pounds did he sell during March?

(7)

1st day.	2d.	3d.	4th	5th
245 miles	98	185	106	44

How far did we ride in five days?

(8)

178 feet

85 ft.   Field   85 ft.

178 feet
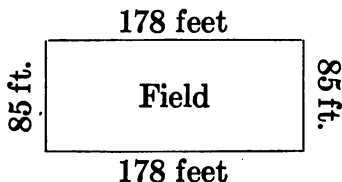
If you walk around the field, how many feet will you walk?

NOTE.—Let the pupils read both addends and sum, and thereby secure accuracy in reading numbers.

LESSON II

31   Operation

8 14
$9\!\!\!/4$
-65

29 = remainder
or difference

Proof-check
65
29
⁽¹⁾
94

What does the *minus* sign mean? We get less by taking away or subtracting. Read the number from which something is to be taken away. How many tens? How many units? Read the number to be taken away. How many tens? How many units? Then we are to take away 5 units from 4 units. Since we cannot do that, we take 1 of the 9 tens and separate it into 10 units. Putting the 10 units with the 4 units, we have changed the number to 8 tens and 14 units. What number must be added to 5 to make 14? Then 14−5 = what number? 14 units −5 units = how many units? Write 9 under the units. What number must be added to 6 to make 8? Then 8−6 = what number? 8 tens − 6 tens = how many

1. 98	**2.** 88	**3.** 87
-59	-49	-68
4. 77	**5.** 86	**6.** 76
-59	-27	-59
7. 65	**8.** 45	**9.** 34
-46	-27	-18
10. 44	**11.** 73	**12.** 63
-26	-44	-35

13. 52   14. 62   15. 81   tens? Write 2 under the tens.
   −35   −26   −55   94 − 65 = what number? How
   ‾‾‾   ‾‾‾   ‾‾‾   much greater is 94 than 65?
                             Then 29 = the remainder or
16. 91   17. 60   18. 80   difference. How much less is
   −68   −35   −46   65 than 94? Then what num-
   ‾‾‾   ‾‾‾   ‾‾‾   ber must be added to 65 to
                             make 94?   Add 29 to 65.
19. 70   20. 90   21. 31   What is the sum?   94.   This
   −54   −67   −29   proves that the subtraction is
   ‾‾‾   ‾‾‾   ‾‾‾   correct. Prove all your sub-
                             tractions.

22. 81 23. 92 24. 65 25. 67 26. 81 27. 70 28. 55
   −73   −87   −58   −38   −45   −39   −27
   ‾‾‾   ‾‾‾   ‾‾‾   ‾‾‾   ‾‾‾   ‾‾‾   ‾‾‾

Operation   Read the number from which
5 12 14   something is to be taken away.
6̸ 3̸ 4̸ = minuend   Call this number the *minuend.*
3 7 5 = subtrahend   How many hundreds?   How
2 5 9 = remainder   many tens? How many units?
        or difference   Read the number to be sub-
                             tracted.   Call this number the
Proof-check   *subtrahend.*   How many hun-
        259   dreds? How many tens? How
        375   many units? Since we can not
        (1)(1)   take 5 units from 4 units, we take
        634   1 of the 3 tens, separate it into

29. 326
-137

30. 408
-269

31. 630
-372

32. 540
-286

33. 510
-137

34. 710
-418

35. 251
-169

36. 325
-257

37. 3 $\overset{9}{10}$ 10
   4 0 0
-1 6 3

   2 3 7 = remainder
       or difference

10 units, place it with the 4 units, making 14 units. Since we can not take 7 tens from 2 tens, we take 1 of the 6 hundreds (leaving 5 hundreds), separate it into 10 tens, place it with the 2 tens, making 12 tens. We have changed the number to 5 hundreds, 12 tens, 14 units. From this we are to take away 3 hundreds, 7 tens, 5 units. What must be added to 5 to make 14? $14 - 5 =$ what? 14 units $- 5$ units $= ?$ units. Write 9 under the units. What number must be added to 7 to make 12? $12 - 7 =$ what? 12 tens -7 tens $=$ how many tens? Write 5 under the tens. What number added to 3 will make 5? $5 - 3 =$ what? 5 hundreds $- 3$ hundreds $=$ how many hundreds? Write 2 under the hundreds. Read the remainder. Prove that this is correct.

Read the minuend; the subtrahend. Here we must take 1 hundred from the 4 hundreds, separate it into 10 tens, and place the 10 tens in the tens column. Then we must take 1 ten from the 10 tens, separate it

into 10 units, and place the 10 units in the units column. Then we can subtract 3 units from 10 units, 6 tens from 9 tens, 1 hundred from 3 hundreds. Use the check to prove this is correct.

32   **Problems**

(1) How much more are 136 pounds than 87 pounds?

(2) A$\underset{\text{200 mi.}}{\overset{\text{87 mi.}}{\rule{1cm}{0.4pt}}}B\underline{\quad}$?$\underline{\quad}$C   Find how many miles from B to C.

(3) From 350 yards of silk, 185 yards were sold. How many yards were left?

(4) With a $5.00 bill I paid for purchases amounting to $3.75. How much change should I receive?

(5) How much less are 68 cows than 105 cows?

(6) There are 365 days in a year. If 195 days have passed, how many remain?

(7) In a school of 475 pupils, 386 are present. How many pupils are absent?

(8) If you have read 158 of the 230 pages in your book, how many have you yet to read?

(9) If your father had 150 chickens, and sold 95, how many had he left?

(10) If a man has in bank $743, how many dollars must he put in to make $900?

Seat-work suggestions: (1) Let pupils lay pegs in bundles of 10, separating a bundle where necessary to illustrate this method of subtraction.

(2) Let them copy subtractions, read the numbers, write them from dictation, etc.

33   **Review**

2×9					9 / 9					1×9
2×8				8 / 8		9 / 8				2×8
2×7			7 / 7		8 / 7		9 / 7			3×7
2×6		6 / 6		7 / 6		8 / 6		9 / 6		4×6
2×5	5 / 5		6 / 5		7 / 5		8 / 5		9 / 5	5×5
2×4	4 / 4	5 / 4	6 / 4	7 / 4	8 / 4	9 / 4				6×4
2×3	3 / 3	4 / 3	5 / 3	6 / 3	7 / 3	8 / 3	9 / 3			7×3
2×2	2 / 2	3 / 2	4 / 2	5 / 2	6 / 2	7 / 2	8 / 2	9 / 2		8×2
2×1	1 / 1	2 / 1	3 / 1	4 / 1	5 / 1	6 / 1	7 / 1	8 / 1	9 / 1	9×1

For drill on the 45 combinations: (1) Add upper and lower number in same block.

(2) Subtract lower from upper. Use a figure in the tens place before each of the upper numbers.

(3) Add the lower number.

(4) Subtract the lower number.

(5) Add the lower numbers in the blocks in the same horizontal line, counting 1's, 2's, etc., getting 9 ones, 8 twos, and so on.

(6) Along the left oblique line from bottom to top get 2 times the numbers from 1 to 9.

I.
$$\frac{1}{2}$$
2
4
$\frac{1}{3}$ dozen = how many?
3
$\frac{1}{4}$
$2\frac{1}{2}$

2.
3
$1\frac{1}{2}$
$\frac{1}{4}$ gallons = how
2   many pints?
$\frac{1}{8}$
- 4

3. $5+16 = ?$
$6+ ? = 24$
$7+23 = ?$
$8+ ? = 35$
$9+ ? = 26$
$4+23 = ?$
$2+ ? = 12$
$1+35 = ?$
$3+ ? = 30$

4. $\frac{1}{2}$ of $8 = ?$
$\frac{1}{3}$ of $? = 4$
$\frac{1}{4}$ of $? = 2$
$\frac{1}{2}$ of $16 = ?$
$\frac{1}{3}$ of $15 = ?$

5.
29
36
45
62
51   $-9 = ?$
37
49
73

6.
28
39
45
26
17   $-8 = ?$
53
40
32

7. $17-7 = ?$
$23 - ? = 15$
$30 - 3 = ?$
$41 - 5 = ?$
$29 - ? = 22$
$50 - 5 = ?$
$33 - ? = 24$
$25 - ? = 18$

8. 123   **9.** 253   **10.** 375   **11.** $2 \times 5 = ?$
  +405   +126   +263 $3 \times 4 = ?$
  317   98   162 $4 \times 5 = ?$
    69   132 $2 \times 3 = ?$
    36   205 $3 \times 3 = ?$
                            $4 \times 2 = ?$

12. 865   **13.** 705   **14.** 623
  −432   −382   −189

LESSON III

Multiplication by 3, 4, and 5

34   How much are 3 men and 3 men and 3 men?   4 men and 4 men and 4 men?   5 men and 5 men and 5 men?   6 men and 6 men and 6 men?   Another way and a quicker way to say 3 men and 3 men and 3 men is to say 3 times 3 men (3 ×3); to say 4 men and 4 men and 4 men is to say 3 times 4 men (3 ×4); etc.   At first we must add to find the answer, then we must learn it so as to say it the short way.   The long way we call *addition;* the short way we call *multiplication.*   Now find by adding what 3 ×7 equal; 3 ×8; 3 ×9; 3 ×10; 3 ×11; and 3 ×12.   Of course, if we want to use the short way we shall have to learn these answers "by heart," so I will write them all in a good way to learn.

Table

$3 \times 1 = 3$		$3 \times 7 = 21$
$3 \times 2 = 6$		$3 \times 8 = 24$
$3 \times 3 = 9$		$3 \times 9 = 27$
$3 \times 4 = 12$		$3 \times 10 = 30$
$3 \times 5 = 15$		$3 \times 11 = 33$
$3 \times 6 = 18$		$3 \times 12 = 36$

NOTE TO TEACHER.—Have this table and all succeeding ones learned thoroughly, and by real and frequent drill well fixed in the minds of the pupils. Here again thoroughness is essential to progress.

In *multiplication* call the answer the *product*.

What is $\frac{1}{3}$ of 27? When we say $\frac{1}{3}$

$$\begin{array}{r} 9 \\ \times\ 3 \\ \hline 27 \end{array} = \text{product}$$

of 27, we mean we divide 27 into 3 equal parts. We say we divide 27 by 3. We write it this way: $27 \div 3 =$ 9; or $3\overline{)27}$
        9

(Note the new symbols $\div$ and $)\underline{\quad}$).

(Multiplying by 4 and 5 will be taught in the same way. Remember that the pupils have heretofore learned only through 4×5 and 5×5. Write the formal tables as before, and have them memorized through much use and frequent drill. Teach the converse process incidentally, and have the pupils grow accustomed to the symbol and form of division at the same time that they are learning multiplication.)

Drill:
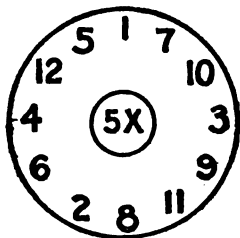
(Change the central figure to extend the exercise.)

	1.	**2.**	**3.**	**4.**	**5.**
	12	0	1	0	
	1	2	4	6	
	11	4	7	1	$36 \div 4$
	2	6	10	7	$28 \div 4$
	10	8	2	2	$40 \div 5$
$2 \times$	$3 = ?$	$3 \times$ $10 = ?$	$4 \times$ $5 = ?$	$5 \times$ $8 = ?$	$32 \div 4$ $= ?$
	9	12	8	3	$27 \div 3$
	4	11	11	9	$48 \div 4$
	8	9	3	4	$35 \div 5$
	5	7	6	10	$24 \div 3$
	7	5	9	5	$24 \div 4$
	6	3	12	11	
		1		12	
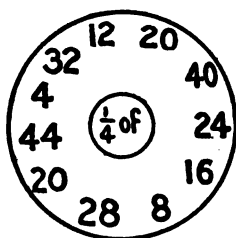
6.   4)44   3)36   4)36

3)27   4)32   5)45

7.   5)30   5)35   5)60

4)48   5)50   4)20

(Change figures to extend exercise.)

Multiplication of Numbers of Two Orders.

Of course we sometimes have to multiply large numbers, so let us learn now how to do that. Let us take 3 times 45. How much are 3×5 units? Set the 5 in the units column, and place the 1 ten above in the tens column so as to remember to add it to the other tens. Now, 3×4 tens $= 12$ tens, which with the 1 ten to be "carried" make 13 tens; that is, 3 tens and 10 tens. Place the 3 in the tens column. The 10 tens make 1 hundred, so write the 1 in the hundreds column. Read the product.

We prove this by doing it another way, by multiplying the columns separately and then adding the little products.

Operation	Proof-check
(1)	15
45	12
$\times$ 3	———
———	135
135 = product	

Drill:

8.
49	86	64	19	98	74	75	83	46	18
$\times 3$	$\times 3$	$\times 4$	$\times 5$	$\times 5$	$\times 4$	$\times 4$	$\times 4$	$\times 4$	$\times 3$

LESSON IV

TIME: Days—Weeks—Months—Year

35 How many days in each week? Say the names of
the days. The long time from one of your birthdays
to another, or from one Christmas to another, or from
one Fourth of July to another is called a *year*. Where
we usually begin to count is New Year's Day; and the
whole year is divided into *12 months*. Their names are:

January, 31 days May, 31 days   September, 30 days
February, 28 days June, 30 days   October, 31 days
March, 31 days   July, 31 days   November, 30 days
April, 30 days   August, 31 days December, 31 days

The months are not all of the same length.

How many days in the shortest month? How many
weeks?

How many days in the longest months? How many
weeks and how many days over?

We say then that there are 4 weeks in a month,
meaning about 4 weeks.

Try to learn the names of the months in order.

(Teach the use of the calendar, and have the pupils
write the date each day. Emphasizing one or more
important happenings each month will help the pupils
to learn the names and sequence of the months.)

8—Pt. I

Problems

(1) How many days in January, February, and March?

(2) How many days in April, May, and June?

(3) How many days in the first half of the year?

(4) How many days in July, August, and September?

(5) How many days in October, November, and December?

(6) How many days in the second half of the year?

(7) How many days in a whole year?

(8) How many months in $\frac{1}{2}$ of a year, $\frac{1}{3}$ of a year, and $\frac{1}{4}$ of a year?

(9) How many days in 5 weeks?

(10) How many school days in 5 weeks?

(11) In a year there are 365 days. If 197 of them have gone, how many are still to come?

(12) How many days in 2 years? 3 years? 4 years? 5 years?

(13) How many months in $\frac{1}{6}$ of a year? in $\frac{2}{6}$? in $\frac{3}{6}$? in $\frac{4}{6}$? in $\frac{5}{6}$?

Review

36 1.

$$2 \times \begin{array}{|c} 1 \\ 10 \\ 3 \\ 30 \\ 4 \\ 40 = ? \\ 7 \\ 70 \\ 2 \\ 20 \\ 5 \\ 50 \\ 6 \\ 60 \end{array}$$

2.

$$3 \times \begin{array}{|c} 12 \\ 1 \\ 11 \\ 2 \\ 10 \\ 3 = ? \\ 9 \\ 4 \\ 8 \\ 5 \\ 0 \\ 6 \end{array}$$

3.

$$4 \times \begin{array}{|c} 6 \\ 0 \\ 7 \\ 1 \\ 8 \\ 2 = ? \\ 9 \\ 3 \\ 10 \\ 4 \\ 11 \\ 5 \\ 12 \end{array}$$

4.

$$5 \times \begin{array}{|c} 12 \\ 1 \\ 11 \\ 6 \\ 10 = ? \\ 5 \\ 9 \\ 4 \\ 8 \\ 3 \\ 7 \\ 2 \end{array}$$

5.

63	17	94	85	36	75	89
× 5	× 4	× 3	× 5	× 4	× 3	× 4

Read and write each product.

6.

$$\tfrac{1}{3} \text{ of } \begin{array}{|c} 36 \\ 27 \\ 18 \\ 9 = ? \\ 30 \\ 24 \\ 15 \\ 12 \end{array}$$

7.

$$\tfrac{1}{4} \text{ of } \begin{array}{|c} 48 \\ 24 \\ 32 \\ 20 \\ 36 = ? \\ 16 \\ 44 \\ 12 \\ 40 \end{array}$$

8.

$$\tfrac{1}{5} \text{ of } \begin{array}{|c} 60 \\ 20 \\ 50 \\ 30 \\ 25 = ? \\ 35 \\ 45 \\ 15 \\ 10 \end{array}$$

1	5	9	2
12			6
8	2×		10
4	11	7	3

NOTE.—Change the figure in the small square to extend the drill. Change the order of the outer figures so as to insure genuine work. Strive for rapid calculation as the result of frequent and systematic drills.

37 Seat-work suggestions: (1) Write multiplication tables and the converse division tables.

(2) From a calendar find how many weeks in 3 months, 6 months, a year, etc.

(3) From a calendar find how many days in particular months.

˙LESSON V

Reading and Writing Numbers to 1000

38

Thousands	Hundreds	Tens	Units
			9
	9	9	
9	9	9	

Read the first number. You mean 9 units. Read the second number. By 99 you mean 9 tens and 9 units. Read the third number. This means 9 hundreds, 9 tens, and 9 units. Which is the *units* column? The *tens* column? The *hundreds* column? How many units make 1 ten? How many tens make 1 hundred? .Suppose we add one more unit to 999. What do we get? (10 hundreds.) Now these 10 hundreds we call 1 thousand. We write the 0 in the hundreds column, and the 1 in the next column to the left, which is the thousands column. Which is the THOUSANDS column?

Read:

19
643
197
105
498
650
433
178
274
900
1000
1225

Every number which contains hundreds must have three figures. If it has no tens, we must write a o in the tens place; or if it has no units, we must write a o in the units place. (4th and 6th numbers.)

Write the names of these numbers. Be careful to spell every word correctly.

1467   NOTE.—When the pupils write numbers from

896   words, have them first arrange a form thus:

743

87

143

97   thousands hundreds tens units

436   0 0 0 0

2914

1250

97   under which the numbers should be placed. This will
keep them in symmetrical lines, will avoid difficulty
incidental to vacant orders, and will aid much in
general accuracy. A child should have some way to
know his work is correct,—hence insist upon proof-
checks and other aids. In reading numbers do not
use the word *and*. Reserve that for subsequent use
with fractions. For instance: 1225—One thousand,
two hundred, twenty-five.

39 Seat-work: Write many numbers from words.
Write the names of many numbers. (Use the addends
and results of addition.)

Review of Tables
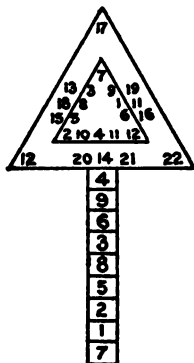
Add the numbers in the small squares to those in the triangles. Extend the exercise by the number of tens, thus: 4+7, 4+17, 4+27, etc.

Subtract the numbers in the squares from those in the outer triangle.

Multiply the numbers in the inner triangle by 2, 3, 4, and 5.

14		30				32		35	
18		12				12		45	
2		33				28		15	
12		36				36		5	
24		18				4		40	
22	÷2 =?	3	÷3 =?	¼ of	24 =?		⅕ of	30 =?	
8		27				48		25	
20		21				44		60	
4		9				16		10	
10		24				40		55	
16		15				8		20	
6						20		50	

NOTE.—Much drill now, great ease later.

LESSON VI

Multiplication. 6 Times

40 2+2+2+2+2+2

3+3+3+3+3+3

4+4+4+4+4+4

9+9+9+9+9+9

(a)		(b)
6×1 = 6		1×6 = 6
6×2 =12		2×6 =12
6×3 =18		3×6 =18
6×4 =24		4×6 =24
6×5 =30	or	5×6 =30
6×6 =36		6×6 =36
6×7 =42		7×6 =42
6×8 =48		8×6 =48
6×9 =54		9×6 =54

Add 2, 2, 2, 2, 2, and 2. How many 2's did we add? How many times did we take 2? Then 6 times 2 (6×2) = what number? Write it the short way. Add 3, 3, 3, 3, 3, 3. How many 3's did we add? How many times did we take 3 ? Then 6 times 3 (6×3) = what number? Write it the short way. Continue through 4's, 5's, 6's, 7's, 8's, and 9's, obtaining the new products 6×6, 6×7, 6×8, 6×9.

Notice that we can write these multiplications several ways. Read them in the column marked (a), 6 times 1 = 6; 6 times 2 = 12, etc. Read them in the column marked (b); (c); (d).

		(c)		
2	3	4	to	9
×6	×6	×6		×6

		(d)		
6	6	6	to	6
×2	×3	×4		×9

How many 2's did we add to get 12? How many 2's are in 12? Into how many 2's can we divide 12? Then say, 12 divided by 6 (12 ÷ 6) = 2. Write it that way.

$6 \div 6 = 1$	$6 = 1$	2	6		18
$12 \div 6 = 2$	$12 = 2$	5	18		54
$18 \div 6 = 3$	$18 = 3$	4	30		36
$24 \div 6 = 4$	$24 = 4$	3	24		24
$30 \div 6 = 5$	$\frac{1}{6}$ of $30 = 5$ $6 \times$	9 = ?	42	$\div 6 = ?$ $\frac{1}{6}$ of	48 = ?
$36 \div 6 = 6$	$36 = 6$	7	54		12
$42 \div 6 = 7$	$42 = 7$	6	48		42
$48 \div 6 = 8$	$48 = 8$	1	12		6
$54 \div 6 = 9$	$54 = 9$	8	36		30

41 Application: (1) How many in $\frac{1}{6}$ of a dozen? In $\frac{1}{6}$ of 3 dozen?

(2) If there are 8 seats in each row, how many seats are there in 6 rows?

(3) How many 5-cent car fares will 30 cents pay?

(4) How many times must the grocer pick up 6 eggs to get 54 eggs?

(5) There are 24 hours in 1 day. How many hours in $\frac{1}{6}$ of a day?

(6) If there are 25 bushels of wheat in each bag, how many bushels in 6 bags?

(7) How many hours in 6 days?

(8) How many inches in 6 yards?

(9) If one pound of butter costs 35 cents, how much will 6 pounds cost?

(10) If one barrel of vinegar holds 63 gallons, how many gallons will 6 barrels hold?

42   7 Times

$7 \times 1 = 7$	$7 \div 7 = 1$	In a similar way the multipli-
$7 \times 2 = 14$	$14 \div 7 = 2$	cation table by 7 may be devel-
$7 \times 3 = 21$	$21 \div 7 = 3$	oped, the only new products
$7 \times 4 = 28$	$28 \div 7 = 4$	being 7×7, 7×8, and 7×9; the
$7 \times 5 = 35$	$35 \div 7 = 5$	new fraction, $\frac{1}{7}$.

$7 \times 6 = 42 \qquad 42 \div 7 = 6$

$7 \times 7 = 49 \qquad 49 \div 7 = 7$

$7 \times 8 = 56 \qquad 56 \div 7 = 8$

$7 \times 9 = 63 \qquad 63 \div 7 = 9$

$$\begin{array}{cccc} 3 & 5 & 6 & 9 \\ \times 7 & \times 7 & \times 7 & \times 7 \\ \hline \end{array}$$

$$\begin{array}{cccc} 2 & 4 & 1 & 8 \\ \times 7 & \times 7 & \times 7 & \times 7 \\ \hline \end{array}$$

$$7\overline{)14} \qquad 7\overline{)28} \qquad 7\overline{)35} \ . \qquad 7\overline{)56} \qquad 7\overline{)63} \qquad 7\overline{)42}$$

Drill:

$$7 \times \begin{vmatrix} 2 \\ 5 \\ 4 \\ 1 \\ 9 \\ 6 \\ 7 \\ 3 \\ 8 \end{vmatrix} = ? \qquad \begin{vmatrix} 35 \\ 14 \\ 7 \\ 63 \\ 42 \\ 21 \\ 56 \\ 28 \\ 49 \end{vmatrix} \div 7 = ? \qquad \frac{1}{7} \text{ of } \begin{vmatrix} 28 \\ 35 \\ 56 \\ 21 \\ 14 \\ 7 \\ 63 \\ 42 \\ 49 \end{vmatrix} = ?$$

25	32	41	53	64	19
× 7	× 7	× 7	× 7	× 7	× 7

31	82	16	27	18	29
× 7	× 7	× 7	× 7	× 7	× 7

123	131	124	132	125
× 7	× 7	× 7	× 7	× 7

43 Application: (1) 35 days make how many weeks? 63 days make how many weeks?

(2) What will 7 dozen oranges cost at 35 cents a dozen?

(3) What will 7 yards of ribbon cost at 23 cents a yard?

(4) What will 7 pounds of cheese cost at 28 cents a pound?

(5) What will 7 gallons of milk cost at 32 cents a gallon?

(6) If I read 55 pages in my book every day, how many pages shall I read in a week?

(7) How many days in 13 weeks? In 52 weeks?

(8) How many pounds of flour will 7 sacks hold, if each sack holds 48 pounds?

(9) If it costs me 18 cents to get to town each day, how much will my fare cost for a week?

(10) If you save 15 cents a day, how much will you save in a week?

8 Times

44 8×1 = 8   8÷8

8×2 =16   16÷8   In a similar way the multiplica-

8×3 =24   24÷8   tion table by 8 may be developed,

8×4 =32   32÷8   the only new products being 8×8

8×5 =40   40÷8   and 8×9. The fraction $\frac{1}{8}$ has

8×6 =48   48÷8   already been used.

8×7 =56   56÷8

8×8 =64   64÷8

8×9 =72   72÷8

Drill:

$$8 \times \begin{vmatrix} 2 \\ 5 \\ 8 \\ 1 \\ 4 \\ 6 \\ 7 \\ 9 \\ 3 \end{vmatrix} = ? \qquad \begin{vmatrix} 40 \\ 16 \\ 32 \\ 72 \\ 56 \\ 8 \\ 64 \\ 24 \\ 48 \end{vmatrix} \div 8 = ? \qquad \frac{1}{8} \text{ of } \begin{vmatrix} 24 \\ 48 \\ 16 \\ 72 \\ 32 \\ 40 \\ 64 \\ 8 \\ 56 \end{vmatrix} = ?$$

3	5	7	9	6	4	8
×8	×8	×8	×8	×8	×8	×8

8)16   8)40   8)64   8)32

17	16	87	24	63	42	19
× 8	× 8	× 8	× 8	× 8	× 8	× 8

120	121	109	112	111	106
× 8	× 8	× 8	× 8	× 8	× 8

45 Application: (1)A milkman has 32 gallons of milk. How many pints has he?

(2) A grocer sells 63 gallons of molasses by the pint. How many pints does he sell?

(3) What must I pay for 8 pecks of potatoes at 25 cents a peck?

(4) What will a turkey weighing 8 pounds cost at 23 cents a pound?

(5) What will a farmer receive for 8 chickens, sold at 65 cents each?

(6) How many hours in 8 days?

(7) How many inches in 8 yards?

(8) How many oranges in 8 dozens?

(9) How many cents in 8 quarter dollars?

(10) How many sheets of paper in 8 bundles of 24 sheets each?

9 Times

46 $9 \times 1 = 9$ $9 \div 9 = 1$

$9 \times 2 = 18$ $18 \div 9 = 2$ In the multiplication table

$9 \times 3 = 27$ $27 \div 9 = 3$ by 9 up to 72, there is no new

$9 \times 4 = 36$ $36 \div 9 = 4$ product, all the products being

$9 \times 5 = 45$ $45 \div 9 = 5$ in the preceding tables.

$9 \times 6 = 54$ $54 \div 9 = 6$

$9 \times 7 = 63$ $63 \div 9 = 7$

$9 \times 8 = 72$ $72 \div 9 = 8$

2	5	6	8	4	3	7	1	2
×9	×9	×9	×9	×9	×9	×9	×9	×9

9) 9   9)27   9)45   9)72   9)36   9)18

1 of 9

Drill:

2	18
8	45
3	27
9 × |7 = ? 36| ÷ 9 = ?
1	54
4	72
5	63
6	9

11	12	13	14
× 9	× 9	× 9	× 9

15	16	17	18
× 9	× 9	× 9	× 9

22	45	56	87	38	63	31
× 9	× 9	× 9	× 9	× 9	× 9	× 9

111	102	103	104	106	108
× 9	× 9	× 9	× 9	× 9	× 9

47 Application: (1) If our city has 25 baseball teams of 9 boys each, how many boys play?

(2) How many tomato plants in 9 rows of 18 plants each?

(3) How many pecks of apples in 9 barrels, each holding 13 pecks?

(4) How many pounds of butter in 9 rolls of 15 pounds each?

(5) If a newsboy delivers 36 papers daily, how many papers does he deliver in 9 days?

(6) What will 9 baskets of grapes cost at 12 cents a basket?

(7) How many eggs in 9 dozen?

(8) How many months in 9 years?
(9) How many inches in 9 yards?
(10) At 9 cents a quart, what will 11 quarts of milk cost?

48   **Review**

Add 2 to 9, 19, 29, 8, 18, 28, 4, 24, 6, 16, 5, 25, 7, 3
    3 to 1, 11, 5, 15, 8, 3, 9, 6, 2, 7, 4
    4 to 9, 1, 8, 2, 7, 3, 6, 4, 5
    5 to 8, 0, 9, 1, 7, 3, 6, 4, 5
    6 to 1, 4, 7, 10, 2, 5, 8, 3, 6, 9
    7 to 9, 6, 3, 8, 5, 2, 7, 4, 1
    8 to 2, 4, 6, 8, 1, 3, 5, 7, 9
    9 to 9, 7, 5, 3, 1, 8, 6, 4, 2*

198	298	123	149	139	314	91	19
643	765	456	149	378	137	29	29
917	124	789	149	149	145	81	18
	113	123	149	373	159	64	46
	178	134	149	198	176	37	54

49 Read and write the name of each addend and of each sum.

416	743	1021	94	287	463
−279	−598	−498	× 6	× 5	× 8

*This drill may be extended thus :
            9 to 9, 19, 29, 39, to 99;
            7 to 7, 17, 27, 37, to 97, etc.

1593	416	716	94	163
−649	−281	−298	×8	×7

410	416		169	128
−298	−195		× 7	× 9

9)72   8)72   6)72   6)48   8)48   4)48

7)28   6)24   9)36   6)36   4)36   3)36

	49		64		18
	63		56		27
	28		40		45
	14		72		54
⅐ of	35 = ?	⅛ of	32 = ?	⅑ of	63 = ?
	56		24		36
	70		16		27
	21		8		9
	7		48		72

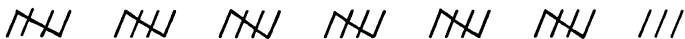Beginning at 1, count by 2's, 3's, 4's, 5's, 6's, 7's, 8's, 9's, 10's to 100.

Beginning at 100, count back by 2's, 3's, etc.

LESSON VII

Practical Counting

50 1. You have learned the multiplication table by 5. Say it.

2. Beginning at 0, count by 5's to 50. Count by 10's to 50. Counting by 5's is very useful. Suppose you sit at your front window and count the people who pass your house in an hour; or, sit on your front porch, and count the horses that pass along the road. If you count by *ones*, you may miss your count. There is another way to count, which is easy and sure; this is by strokes in groups of 5. For instance, you count, and I will make the strokes.

　　/+++/　　/+++/　　/+++/　　/+++/　　/+++/　　/+++/　　/ / /

3. How many 5's have you counted? How many are six 5's? Then you have counted 30 and 3, or 33.

4. How many strokes are in 2 groups? How many 10's have you counted? How many are three 10's? Then you have counted 30 and 3, or 33.

Notice that I made 4 strokes up and down (////) and 1 stroke across these (/+++/), completing a group of 5. Can you tell any other things which you could count in this way? (As the pupils answer to the roll call, let them count in this way how many are present.)

Grown-up people often count by 5's. At an election they count the number of votes Mr. A. receives and the number Mr. B. receives. In unloading wagons, cars, and boats, they count the number of bags or barrels, of watermelons, of baskets of tomatoes and peaches, by this method, which we call *scoring* or *keeping tally*.

Now say the multiplication table by 3. Count by 3's from 0 to 36. Say the multiplication table by 6. Count by 6's from 6 to 72. Have you ever seen the farmer or the store-keeper count eggs? How many eggs did he pick up with one hand? How many times must he pick up 3 to get a dozen? How many did he pick up when he used both hands? How many times must he pick up 6 to get a dozen? How many times must he use one hand to count 3 dozens? How many times must he use both hands to count 6 dozens?

How many eggs in a dozen? What part of a dozen are 3 eggs? 6 eggs = what part of a dozen? 24 eggs = how many times 3 eggs? 48 eggs = how many times 6 eggs?

Do you know anything besides eggs that are counted by 3's? Yes, any articles that are bought and sold by the dozen.

(1) A dealer used both hands 8 times in counting eggs. How many eggs did he count? How many dozen?

(2) How many times did a store-keeper use one hand in filling a box with a dozen eggs?

$$
\begin{array}{l}
12 \\
36 \\
60 \\
24 \\
48 \\
72
\end{array}
= \left\{
\begin{array}{l}
\text{how many dozen?} \\
\text{how many 6's?} \\
\text{how many 3's?}
\end{array}
\right.
\quad
\tfrac{1}{3} \text{ of }
\begin{array}{l}
12 \\
36 \\
24 \\
18 \\
9 \\
27 \\
21
\end{array}
= ?
\quad
\tfrac{1}{6} \text{ of }
\begin{array}{l}
12 \\
30 \\
48 \\
36 \\
60 \\
54 \\
18 \\
24
\end{array}
= ?
$$

NOTE.—Roman numerals to fifty should be taught, and used as much as practicable in connection with telling time, numbers of chapters, etc.

51   **LESSON VIII**

General Review

1. How many pints in
```
8 gills
4 quarts
5 gallons
½ gallon
6 quarts
24 gills
¼ gallon
8 quarts
2½ quarts
```

2.

How many
days in
```
4 weeks
7 weeks
1 year
8 weeks
9 weeks
Jan., Feb.
Mar., Apr.
Dec., Jan.
```

3.

How many
weeks in
```
56 days
63 days
14 days
1 month
3 months
70 days
6 months
21 days
1½ months
```

4.
```
¼ of a dollar
½ of a dollar
½ of 50 cents
⅕ of 25 cents
A nickel
A dime
A quarter
5 dimes
2 quarters
A dollar
A quarter and 2 dimes
3 quarters, a dime, and a nickel
```
= how many cents?

5. 1 ft.
2 ft.
1 yd.
$\frac{1}{2}$ yd.
$\frac{1}{4}$ yd.
$\frac{2}{4}$ yd.
$\frac{3}{4}$ yd.
$\frac{1}{6}$ yd. = ? inches
3 ft.
$\frac{1}{2}$ ft.
$\frac{1}{3}$ ft.
$\frac{2}{3}$ ft.
$\frac{1}{4}$ ft.
$\frac{2}{4}$ ft.
$\frac{3}{4}$ ft.

6. 395 × 7	7. 214 × 8	8. 478 × 9
9. 149 × 7	10. 764 × 8	11. 169 × 9
12. 194 × 7	13. 194 × 8	14. 243 × 9
15. 256 × 7	16. 179 × 8	17. 684 × 9
18. 176 × 7	19. 256 × 8	20. 218 × 9
21. 219 × 7	22. 176 × 8	23. 463 × 9

52

Multiply each number in the ring by each one outside, in turn. The exercise should be rapid. There will be a few combinations still untaught, which the pupils will learn unaided, rather than pass over.

1. 196 −139	2. 413 −219	3. 416 −198	4. 197 −109
5. 216 −149	6. 1219 −719	7. 138 − 79	8. 1216 −987

(A good drill in numeration is to have the pupil write many of his results in words.)

53 **Problems**

(1) A man had to pay eight hundred fifty-seven dollars. How much would be left from one thousand dollars?

(2) There are 196 children in one school, 739 in another, and 458 in another. How many children are in all three schools?

(3) A bag of flour costs 85 cents, what will 8 bags cost?

(4) How much more is $614 than $297?

(5) Take $87 from $203.

(6) Multiply 498 by 9.

(7) It is 178 feet on one side of a big square. How far is it all the way around it?

(8) How many inches in 7 yards? In 9 yards? In 5 yards?

(9) How many inches in $\frac{1}{4}$ yd., $\frac{1}{3}$ yd., $\frac{1}{2}$ yd., and 17 inches?

(10) A milkman sold cream for 32 cents a quart. What would he get for 6 quarts?

(11) There are 68 apples in one pile, 125 in another, 209 in another, and 75 in another. How many apples are in the four piles?

(12) Seven boys each have 56 feet of kite string. How many feet have they all?

2	8	9	3	1
5	6		3	5
8	2		9	8
7	7	5	8	6
3	0	7	9	5
				4
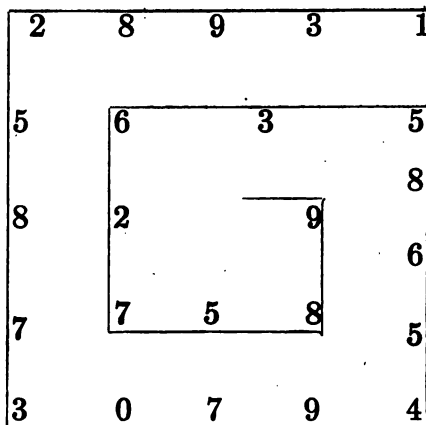
1. Beginning at the 1, add 2, 3, 4, etc., to the numbers in the square. Extend the drill by adding to 11, 21, 31, etc.; to 3, 13, 23, etc.

2. Take 2, 3, 4, etc., from the numbers, adding a ten to the minuend when the subtrahend exceeds it.

3. Multiply by 2, 3, 4, etc.

(Aim for rapid calculation. By this time the 45 combinations should be automatic, and the multiplication tables well learned.)

In
```
46
52   how many 5's and how many over?
13     "    "   4's  "    "    "    "  ?
24     "    "   6's  "    "    "    "  ?
16 are "    "   9's  "    "    "    "  ?
43     "    "   8's  "    "    "    "  ?
50     "    "   3's  "    "    "    "  ?
21     "    "   7's  "    "    "    "  ?
40
36
```

1.	**2.**	**3.**	**4.**
$2 \times 0 = 0$	$3 \times 0 = 0$	$4 \times 0 = 0$	$5 \times 0 = 0$
$2 \times 1 = 2$	$3 \times 1 = 3$	$4 \times 1 = 4$	$5 \times 1 = 5$
$2 \times 2 = 4$	$3 \times 2 = 6$	$4 \times 2 = 8$	$5 \times 2 = 10$
$2 \times 3 = 6$	$3 \times 3 \times 9$	$4 \times 3 = 12$	$5 \times 3 = 15$
$2 \times 4 = 8$	$3 \times 4 = 12$	$4 \times 4 = 16$	$5 \times 4 = 20$
$2 \times 5 = 10$	$3 \times 5 = 15$	$4 \times 5 = 20$	$5 \times 5 = 25$
$2 \times 6 = 12$	$3 \times 6 = 18$	$4 \times 6 = 24$	$5 \times 6 = 30$
$2 \times 7 = 14$	$3 \times 7 = 21$	$4 \times 7 = 28$	$5 \times 7 = 35$
$2 \times 8 = 16$	$3 \times 8 = 24$	$4 \times 8 = 32$	$5 \times 8 = 40$
$2 \times 9 = 18$	$3 \times 9 = 27$	$4 \times 9 = 36$	$5 \times 9 = 45$
$2 \times 10 = 20$	$3 \times 10 = 30$	$4 \times 10 = 40$	$5 \times 10 = 50$
$2 \times 11 = 22$	$3 \times 11 = 33$	$4 \times 11 = 44$	$5 \times 11 = 55$
$2 \times 12 = 24$	$3 \times 12 = 36$	$4 \times 12 = 48$	$5 \times 12 = 60$
5.	**6.**	**7.**	**8.**
$6 \times 0 = 0$	$7 \times 0 = 0$	$8 \times 0 = 0$	$9 \times 0 = 0$
$6 \times 1 = 6$	$7 \times 1 = 7$	$8 \times 1 = 8$	$9 \times 1 = 9$
$6 \times 2 = 12$	$7 \times 2 = 14$	$8 \times 2 = 16$	$9 \times 2 = 18$
$6 \times 3 = 18$	$7 \times 3 = 21$	$8 \times 3 = 24$	$9 \times 3 = 27$
$6 \times 4 = 24$	$7 \times 4 = 28$	$8 \times 4 = 32$	$9 \times 4 = 36$
$6 \times 5 = 30$	$7 \times 5 = 35$	$8 \times 5 = 40$	$9 \times 5 = 45$
$6 \times 6 = 36$	$7 \times 6 = 42$	$8 \times 6 = 48$	$9 \times 6 = 54$
$6 \times 7 = 42$	$7 \times 7 = 49$	$8 \times 7 = 56$	$9 \times 7 = 63$
$6 \times 8 = 48$	$7 \times 8 = 56$	$8 \times 8 = 64$	$9 \times 8 = 72$
$6 \times 9 = 54$	$7 \times 9 = 63$	$8 \times 9 = 72$	
$6 \times 10 = 60$	$7 \times 10 = 70$		
$6 \times 11 = 66$			
$6 \times 12 = 72$			